Academic Course Management System

(ACMS)

by

Mohd Firdhaus Khazali

Dissertation submitted in partial fulfillment of

The requirements for the

Bachelor of Technology (Hons)

(Information and Communication Technology)

June 2006

Universiti Teknologi PETRONAS

Bandar Seri Iskandar

31750 Tronoh

Perak Darul Ridzuan

Abstract

This project provides solutions for the Course Management System currently being used by UTP thru its website to handle academic matters involving students, lecturers and academic staffs. The problem is the system is unsecured by without having proper authentication like validation control and login page that enables anybody to hack into the system and manipulate the contents. Next is unreliability of transactions' data processing and information displaying where the result is not displayed instantly to students and sometimes the result is incorrect and contains wrong information. The significances are the student won't be able to see the latest the transactions' result instantly and incorrect information display. Motivations on these problems are derived from the author when experiencing the common problems like other students. Furthermore, these problems occur every semester; creating displeasure feeling and reduce the trust of users towards the system. Main intentions of this project are to improve the performance of data processing speed, reduce system error in data input and output display, and eliminate traditional process of lab registration. It is also for simplifying and reducing the number of process transactions and to enhance usability and navigation structure by users towards web based applications design. The project implements re-engineering concept where the objective is to breakdown the modules, improve and enhance the necessary parts, restructure them back and come out with totally better system. Visual Studio.NET software is used to design the web application and function while the programming language used is called ASP.NET. The theories gathered from researches conducted are valuable to understood on how to evaluate the potential elements of web usability and to further understand users' requirements. This project covers basic ways of providing security using ASP.NET technology and the elements used to improve the users' pleasure and functionalities expected within education environment at higher education institution. As results, good web based application design are implemented, security method and procedure is developed and provided, data and information is processed faster and displayed accurately, the levels of transaction processes are reduced and also improvements towards system performance and functionalities in navigation and lowering the frequency of problem occurrence. For future work, the integration with mobile devices, SMS or email features in notification and combined together with E-Learning system are strongly recommended for potential improvements and hence more flexibility usage.

Acknowledgement

First and foremost, thank God for this opportunity and seeing me trough some truly difficult times especially through the journey of this Final Year Project. This project would not have been possible without the vital help of University of Technology Petronas (UTP) lecturers, students and those who involves either directly or indirectly for the conceptual contribution in the research and development of this project. First of all, I would like to express my deepest gratitude and appreciation to all parties who have contributed towards the success of my Final Year Project especially to my supportive supervisor, Mr. Mohd Noor Ibrahim towards his idea, guidance, moral support and teaching. Thank you to my parents; family that always has faith in me and supporting me in achieving my dreams. Without all of these parties, it would have been impossible for me to finish this dissertation. I appreciate very much the companion and help I got from past and present graduate students, researchers and UTP staffs that I had privilege to meet and work with. And last but not least, to my fellow colleagues for their companionships, helps, concerns and supports. It is a blessing to know these wonderful people.

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ABBREVIATIONS AND NOMENCLATURES

FYP – Final Year Project

UTP – University of Technology PETRONAS

ACMS – Academic Course Management System

LAN – Local Area Network

ACS – Academic Center Service (academic office)

SDLC – Software Development Life Cycle

SQL – Sequel Query Language for database language

ASP.NET – Active Server Page with NET Framework

IIS – Internet Information Service

CHAPTER 1

INTRODUCTION

Overview

This section will introduce the project which is called as Academic Course Management System (ACMS). ACMS is a re-engineering design and production of online course registration system currently used by UTP in managing course registration, add & drop and course confirmation processes. It is specially designed to improve the existing Course Registration and Add & Drop modules and targeted to overcome and solve the current problems faced by students when dealing with course registration processes. The project involves study and literature review on the previous research done within the same scope of topic area and the implementation of theories and concepts in developing better project and products.

As for this project, it will be implemented via online system or web-based application since the current online system used by UTP is an online system. Furthermore, web-based application system is suitable for delivering online or Internet services to multiple users (students) either for within community or distance users through distributed systems. It intends to deliver exactly the same functional system towards the intended users which are the students but better in terms of system performance, robustness, reliability, security and ability to perform expected functions and services within its academic environment. The new system will allow students to register for their courses, add & drop them and finally obtaining the confirmation through result or updated list about their current process and check the progress of their registration either rightly completed or need corrective actions. ACMS is expected to be able to secure the internal academic course management processes and improves the performance of the system in terms of speed of processing and reliability. Furthermore, ACMS will be provided with additional features that give benefits to both ACS Unit and students.

Purpose of the Study

The main purpose of the study within the context of project development is to perform detail and thorough research and analysis towards web-based application technology, security measurements and benchmarking, methods of improving usability design and framework architecture and finally to understand the necessary requirements for a web-based application to be implemented within education environment. In achieving or supporting these purposes and reasons of project development, the research and analysis will be continuously carried out and will be an ongoing process until the end of project phase. With the available Internet resources and facilities provided within and outside of UTP, it is really hope that the project will be successfully undertaken, completed within the time frame and achieving the purpose of the study.

Background of Study

The needs for online system or we call it as web-based application systems in daily operation keep on increasing in terms of the numbers of usage areas and diversion of complexity in assisting human performing tasks including business or education operations. It is a new trend of technology implementation when it looks potentially capable of reducing workload, simplifying traditional ways of processing transactions, and also saving the time spent. Within education area, online system seems to be more complex and it is crucial with the need for reliable and secure system in processing internal confidential information such as academic record, student profiles, education management issues and others in which must be well-kept and protected from any vulnerability or disclosure.

There are many web services being provided by web-based application system nowadays, for example, financial aid, decision support system, library services, technical support, community portal and others. Many researches and paper work discussing about the challenges and finding the best solution in implementing web-based system (online) within education environment. However, there are not many researchers discuss about online course registration system in their studies and

this creates a challenge for me to prove how this new trend able to satisfy students' needs.

Usability Design & Framework Architecture

It is important for any system to be developed either stand-alone or distributed system regarding its soundness in which provides the benchmarks against which the quality of the system can be compared and thus serve as the guide for application development. In order to complete this part, the study needs to judge the system soundness in terms of application requirements by means evaluating its usability design and its framework. The criteria include the following:

- *Functionality* means the system must meet the requirements of the application; that is must deliver the functionality or services called for by the system.

- *Efficiency* means the system should deliver the correct service or required functions efficiently. It should be capable of minimizing the consumption of computer resources, including computer processing time and the storage space, and also time needed by users to perform their tasks.

- *User-Friendliness* means the ancient concept stipulated that the message to the user be clear, meaningful, and in friendly tone and proper navigational instruction. However, with GUI environment, this concept encompasses a mush wider variety of user expectations like:

    - Provide the user with maximum mobility around the user interface
    - Consistency in appearance and behavior among different windows
    - Flexible in accommodating users' tastes and preferences
    - Guard the user against errors and mistakes and a lot more

In terms of framework, it should emphasize on how the initial and overall structure able to reduce the system design failure and able to guide the delivery of the system services. Among the framework study that will be focused are:

- Consistency in Coding Style means implementation of standard coding convention when developing codes for the system. By this, it will be easier to be read and understand.

- Modularity in Code Design means the each block of code structure should be isolated from the rest of the system; that is each block can perform its designated task without depending on the state of other blocks. In another words, it promotes each block to be independent of the others. Such code framework is easier to debug, review and revise.

Security

The needs for better and more security in system applications nowadays are growing and increasing in number and complexity. The security measurements currently keep on improving and being one of the most crucial issues in most system or software development work in order to provide secure and trustable system which capable of handling data and information transparently and safely without any severe risk. Besides that, it is also important as to protect the organization confidential information from outsiders or unauthorized persons.

Realizing the rich availability of security technologies nowadays, the focus of the project study will mainly on the security solutions, methods and safety improvement suggestion to be made that are suitable with web - based application systems. In order to perform the research, develop and test the theory, the system used by UTP currently will be used as the benchmark of quality improvement in terms of security and some additional package as for the system overall performance, functionality and reliability that will be better compared to the previous system.

Considering the potential usability and implementation of the current security methods and measurement in most system either stand-alone or web-based, this creates new trends in security technology which is lately implemented within ASP.NET technology. The usages of passports, login information, users' sessions, server validation and others have urge the improvement to be made on the current system used by UTP via online in which has less and weak security measurement methods. This is encouraged by the awareness of that system that is widely and relied most by UTP students and academic staffs in handling program courses each semester. UTP supposedly to have secure and well protected web-based system in handling student information but however, due to old methods of development by the freelance developers with limited technology applicable, the system is now openly exposed to a lot of security attack and penetration.

More than that, some other better security measurements was introduced by the ASP.NET which are:

- The Session object is used to manage information about the application that is currently running and unique instances (versions) of the application, which individual users run. Session objects in ASP.NET use cookies to store the Session ID on the cookie, which gets passed to-and-fro between the client and the server.

- Protection of Source Code; ASP.NET allows server side scripting processing uses data gathered from the browser plus rules on the server to produce a result that is sent back out to the browser. Then the result is sent to the users after computed. By this, it doesn't allow interested parties to read the business rules from the browser page.

- ASP.NET ships with built-in request protection to detect inputs that contain scripts; able to reduce the implication of Cross-site Scripting (XSS) or script injection using JavaScript normally , one of the most common attacks on Web applications today. Put simply, XSS happens when a hacker injects a

script into your Web application (normally through user inputs) and your application accepts it without checking it.

- A much better way to store passwords in database by using hashing. Hashing is a one-way process of mapping data (plain text) of any length to a unique fixed-length byte sequence. This fixed-length byte sequence is called a *hash.* Statistically, two different pieces of data would not generate the same hash. And a hash cannot be used to reverse-generate the plain text. In the case of saving passwords in the database, saving the hash value of each password is preferred over the saving the plain password. When a user logs in, the hash value of the password is computed and then compared to the hash value stored in the database.

- Encrypt Sensitive Data, which is a safer way to encrypt the sensitive information and store the "cipher text" into the *Web.config* file either by symmetric; encrypt and decrypt information using a common key, or asymmetric; encrypt and decrypt information using a pair of keys.

- More efficient and consistent way to use data from SQL Server from the Access front end through Microsoft ActiveX® Data Objects (ADO). ADO provides a method of connecting directly to the SQL Server database without having to use the ODBC connection used by linked tables. It able to avoid the decline performance of the existing DAO code and eliminate the bottlenecks.

In terms of security issues, the study should emphasize on how to maximize the current available technology in developing secure and dependable web-based applications. With Internet resources and reference books, it is possible to explore the global knowledge of security knowledge and skills to be implemented within this project and study.

Technology

In terms of technology wise, current trend of web-based development is no longer based on hard coded or internally programming in order to design a simple interface for navigation use. Technology has increase and getting more advances day by day in terms of the usage, implementation and methods. As for the current technology trends, there are a few changes emerge into IT world that change people behaviors and perspective on how technology changes. There are:

- Trends of procedure-oriented language in which procedures or block of codes are separated and independent of each other in which hence the codes performance and compatibility.

- Improvement have been made a lot to Internet services via World Wide Web (WWW) in allowing web content and services to be delivered by using various kinds of web browser, for example Inter Explorer, Mozilla, Opera and others. With the rapid improvement on these browsers features; improving its portability, the need for online system will also increase and needed mostly in order to provide the online service. Furthermore, there are now browsers that capable of supporting cross-platform which makes the need for a standard web format that render correctly on all versions of browsers; in our case, ASP.NET has this feature.

- Easiness to create web form projects by using image and graphic interfaces available or defined in the library in which able to speed up the process of creating web forms, objects and web elements.

- The evaluation on online system are not based on visual appearance only unlike websites and expectation on higher system performance or robustness is crucial with latest available technology in debugging, compiling and checking errors by the compilers to detect system failure elements and correct them instantly.

- Current technology also allows the developer to view the web application in an integrated fashion that makes separating the implementation details of client and server.

- Technology improved as to help user preventing against errors or mistakes in the real time manner. With the availability of current technology in .NET framework, it capable of guiding user against the errors through object and validation controls provided either on the client or server scripting.

- Data catching in web service by storing data in memory for quick access. One of the more common items stored in a cache in a Web application environment is commonly displayed database values; by caching such information, rather than relying on repeated database calls, the demand on the Web server and database server's system resources are decreased and the Web application's scalability increased.

Problem Statements

As for this project scope, the affected parties concerned are the ACS staffs, lecturers and also the UTP students. The focus points and issues of the problem statement will be on the improvement of the security measurement used by the current UTP system. The problems statements for this project will be defined and identified in below section in order to provide the understanding of the reason for project initiation and the consequences of them to the current situation. The problem statements are:

1. The Course Management System used by UTP currently doesn't have strong security method or safety measurement during the web system accessing either from outside or inside of UTP by the students.

2. The system is not fully reliable in terms of processing updated information through Add & Drop Module, delay or late result display, and not performing some other functions that supposedly to be fine and reliable almost of the time especially when it is within the time intended to be used which is the early 2 weeks of each semester.

In order to further elaborate the above problem statements, further explanations will be given in the next discussion section in which we will discuss the supporting statement like evidence, observation result, experiences and examples of scenario that contribute to the phenomenon.

Discussion on Problem Statements

Security Method or Safety Measurement

Currently, Academic Centre Service (ACS) has been using online system in handling course registration, add & drop and course confirmation modules for students every semester. However, based on observation done, the system is insecure and unreliable. Concerning security issue, one of the evidences is the current system doesn't have appropriate security method or validation controls such as login usernames and passwords when students enter the modules through UTP formal website. It doesn't concern about the UTP formal website but mainly when students are going to register for courses, add or drop, or confirming courses in respective modules. This will expose the system to insecure condition, which enables anybody from outside who is potentially to penetrate and hack the academic system by playing around with the modules and use to enter fake or wrong input for any random student whom they know the ID or full name.

Surfing was done through Internet on several online course registration systems available like UiTM, Drake University, University of Wisconsin and some other certain higher education institutions to see how they manage their registration and add & drop modules. But however, their modules couldn't be entered or used due to they have security measurement in order to enter into the "secure areas" as they called it, with the need of "Login PIN (Personal Identification Number)", otherwise they cannot get into the site to do their process. "Login PIN" in their environment serves as the username and the password for them to enter their internal campus system, almost like our Novell system. This is because they never allow outsiders to see their internal system and penetrate into it. As for UTP registration module, from observation, we can see that it doesn't have any PIN number request or at least a login screen at the front page of the modules and worse than that, it will directly links us to the internal modules once we click "Course Registration" hyperlink.

During the submission of electronic registration forms, some of the system parameters could be seen in the URL address with certain symbols by means to pass the arguments of the courses selected to the system and database to be processed and

stored. For a novice user, maybe this doesn't affect much but as for intermediate or expert programmer (potential hacker), if they can see the URL parameters sent and able to understand or read them, perhaps they can make use of it to do SQL injection or penetrate into restricted sites invisible to the normal users based on their technical knowledge in IT and web programming skills that they have. With the latest technology, these parameters should be and can be hided using some encryption method in order to hide potential system penetration and SQL injection using system URL parameters.

From my own experience using the registration system for a long time, I had done the registration process once upon a time for my colleague when he was not around and unable to do so. This is so easy because I remember his full name and student ID. By going through the same process steps, the process was successfully done using the same system. In another perspective, it doesn't secure the module and the users' profile as well since I just need to know the basic profile of the person, not the confidential to get into the system. All this while, the system was never be misused by students yet to do fake process for person they know but this issue can't be neglected just like that since it is a potential security problem in future.

Reliability Issue

Regarding reliability issue, it concerns for add & drop module where sometimes, the courses added or dropped are not updated directly into the database even though all the process flows are correctly followed. The problem is worse when the result will not be displayed instantly to students and sometimes the result is incorrect and displays wrong information. The significances are the student won't be able to see the latest confirmed course registered instantly, the result is delay, unknown status and incorrect information display. This will lead students to redo add & drop processes manually at ACS office. Another problem is the current system never check whether pre-requisite courses for certain subjects were followed or not before. This still need human interference and it might be not efficient enough because certain cases were escape and never be detected. From interview conducted with the registrar in ACS unit, they said that their staffs still have to manually check the pre-

requisite course undergo by a student before they approved the course to be registered.

There was informal survey done to students involving some of my known colleague regarding the course registration, add & drop and confirmation modules issues from their perspective to support my case study. The questions are as below:

1. What do you think about the current registration modules in UTP?
2. Which module(s) do you consider has problem?
3. Is there any impact or consequences do you face due to the problem?

On average result of the interviews, they said that the current registration module in UTP is working fine for them and always allow them to perform their expected tasks such as registering the courses for incoming semester. However, for them it is quite tedious to refresh selected courses first before proceeding with another different course tabs, for example from Second Year Course Tab to the General Studies Course Tab.

As for the second question, their respond were the same in which they said that some of them having trouble with course add & drop and also the confirmation modules. Most of them said that from their experience being in UTP, they had faced the phenomenon many times or at least once in which their registered courses were not correctly added or dropped by the system.

While for the third question, there are some general or common responds regarding the similarity of their answers. From the result, it can be concluded that they realize basically the confirmation module will be affected by the problem caused by add & drop module. The implications faced by them are they have to redo the same process manually through ACS office with the green form in which hey have to refill it again with the same information that they already entered previously in the online system. For the case if their processes are not properly done, it is accepted but most of them are not in that situation. Even though they have no process problem; the right courses registered, add or drop button was clicked, the process confirmation by the system, but still they don't know the factors. Regarding

this problem also, the registrar of UTP has been interviewed regarding this problem and the respond was they also don't know the reasons it happens and it almost every semester students keep on complaints the issue. They believe that it must be something with the internal system fault but until now, there is no exact proof or evidence about it since they believe their work are properly done carefully.

As further problem elaboration, there are some complaints by them regarding the hardness of obtaining the result of process instantly or directly after the process completed. Once they have done add or drop process, the updated list was not displayed like it is done in registration module. The system will only display and stated that the process was completed but not displaying the updated list instantly. This is a crucial requirement since it will allow students to see whether their process are completed correctly or updated and to check whether they need to redo the process or not. This is important since if any problem occurs, they will know it earlier and corrective action can be done as soon as possible by mean able to avoid both problems either to the students or to the staffs. They really hope the process confirmation or updated list can be provided directly to them like the same provided in the course registration module where once the student register the required courses, the list will be displayed instantly.

Objectives of Study

There are four (4) main objectives of the study and the project. The objectives can be specified as below:

- To implement better security measurements to the current system in order to prevent and overcome security vulnerability or exposure hazardous by implementing and applying the latest security measurement using ASP.NET technology in web - based system applications development.

- To improve the current system used in handling program course management in terms of performance quality like the speed of processing and displaying result, reliability of data and information updating and also to reduce, prevent and overcome the system failure.

- To improve the current ACS system by providing additional functions that are reliable and useful in which meets the users' expectation in assisting them performing necessary or important tasks.

- To improve the conceptual design and usability framework architecture in order to prevent system failure or faults in future and increase the reliability of the system towards providing correct services for its intended users.

- To reduce the hard work of ACS staffs who are still doing manual checking and task performance which will be able to reduce human error and time consumption; hence automated system in providing better service and handling its operation.

Scope of the Study

Basically the scope of the study within this project is focused on Online Academic Course Management System that resides in UTP formal website available on the Internet in which consisting of Course Registration and Course Add & Drop modules. These two modules will be the core re-engineering and development basis as it is really important to the background of the study and project initiation. Furthermore, they are the most important and crucial modules being used by students every semester compared to other modules within the same website.

The fundamental of the study and system development will emphasize on security enhancements and functionality improvements on the current system being used by UTP. There are several security solutions and improvements that are going to be implemented to the new system. The study will focus on identifying and choosing the available security measurements within ASP.NET technology and to benchmark how each one of them possibly in reducing and preventing security problems faced by most web based system. Besides that, the scope of the project study is also intends to provide additional functionalities that are relevant to the task performance and also based on the needs by users. These additional functions are going to benefit both users and ACS staff as well by improving their task completion and execution mainly in managing registration, add or drop of subject courses.

Most of the system development will based on system re-engineering in providing the exact system used by students in registering and either add or drop their subject courses every semester. The system usability flows will be the same as previous one in order to support their usability knowledge and familiarity with the available system.

CHAPTER 2

LITERATURE REVIEW

Web-based Application

An extensive review of the literature on Web user-centered design was conducted for the purpose of identifying those elements that constitute an effective user-centered interface for web-based application development. Web applications are distributed applications [1], using the HTTP transport protocol. Although the content of each website is markedly different from the content of other websites, all web designers share a common desire to present their messages and/or products within a user-friendly framework. Designing effective interfaces to support a diverse array of web users, in terms of their information needs; design preferences; cognitive, perceptual and physical abilities; ethno-racial identities, and technological backgrounds, is not an easy task. In fact, from past and current research ideology, there is no one interface that represents the "ideal" web interface. [2]

Interface Design

However, there are some general standards and principles that remain consistent, regardless of the purpose or audience of an interface. Evaluation based on Web usability guidelines is the key in implementing user-centered design. Sites that are user friendly are better positioned to attract and retain a loyal group of users; in our case for the scope of this project, we will focus on students, lecturers, and academic staffs. From my understanding and opinion, the less the users need to think on how to use a web-based system, the better the web it is. This is supported according to web usability expert [3], he indicated that making the choices mindless is one of the main things that make a site easy to use. In providing easy navigating instructions,

the flow should be simple and concise so the user won't get confuse from the bombastic web design or layout. From the literature review done on this researchers work, four (4) elements of an effective interface were identified in which relevant to the ACMS project scope. They are visual design, information architecture, navigation and universal usability. This concise list of design elements was used to evaluate the ACMS interfaces for the users to navigate, use the system and also performing their tasks needed with pleasure and concise manner.

Visual Design / Color Usability

In visual design, according to [4], the use of color can enhance black and white information. In particular, blue should be used for large areas and backgrounds, while red and green, which tend to draw people's attention, are better suited in the centre of the visual field. [4] Furthermore, consistency and redundancy in the presentation of design elements are important aspects of visual design. [5, 6, 7]

The design of the ACMS interfaces for the users' interaction communicates information using color. Even though blue should be used for large areas and background according to [4], for ACMS condition, white color would be preferable as the background color to suit with multiple uses of colors within the system. The interfaces use web browser default link colors, purple and blue, and overall; maintain a consistent orange and white color scheme, which enhances the black textual information. The chosen of orange as the navigational color is because of to support UTP formal or corporate color which is mostly make use of grey and orange. As observation done to "Friendster" community website, it now makes use of orange as the light up color and capable of attracting users' attention and interest. The new interface design and layout will make use of this corporate colors compared to previous system.

Another element of visual design is appropriate page length (no more than 30,000 bytes) and page width of text and font size. [8] Both the ACMS actual system and the prototype basic interfaces will meet this requirement. However, the list of courses to be registered on the ACMS interface presents students with only

one simple selection option, displayed as checkboxes, which adds greatly to the length of the webpage.

Navigation Structure

As for information architecture, textual and iconic labels and controlled vocabulary comprise the information architecture, narrowly defined, of a well-designed interface [9,10,11,12]. In my opinion, if the labels and navigational structure of a website do not support novice and expert users (students, lecturers, ACS staffs), those users will experience an overload of their short-term memory and become disoriented. [13] As a designer or web developer, it is a must to provide both semantic cues (for novice users) and spatial cues (for expert users). Labels, a type of semantic cue, support the navigational path and informational needs of users. However, the use of standard terminology to label the features of the web must be appropriate and enough to guide them. The information must be correct and easy to be understood by users with the right use of terminology and labeling; for example the name of courses and functions on the buttons. In order to provide the best information architecture, for me it must be familiar with the users' knowledge, background or level of usability within the system. Otherwise, the system won't be able to deliver the correct services intended and if it does, maybe it will be misinterpreted.

In navigation, there is consensus in the literature that if the users are unable to maneuver through a website, and successfully find what they are searching for, then the likelihood of continued searching and ongoing use of the website decreases. Navigation plays a significant role in this process and should be intuitive. [14,15,16] Users should be aware that support exists when they navigate through a website or web applications. [18] The interface design should provide meaningful paths and exits, including allowing reversible actions. In the literature, this concept is commonly known as "locus of control". [19] Mandel further suggests that the interface accommodate users of various skill levels and display descriptive messages and text (e.g., password cues). [20] To enable ease of use, the amount of scrolling should be kept to a minimum; therefore, the important information should be placed

near the top of the page. [21,22] Well-designed navigation bars contribute to the failure or success of a user's journey through a site. There are several types of navigation bars in which each serving a particular function that serve to guide users. Generally, navigation bars may be grouped into four main categories: top and/or sidebars, contextual bars, breadcrumb, and site navigation bars. [23]

Objects and Design Item Positioning

Top navigation bars (also referred to as "Global" or "persistent" navigation bars) must be consistent in appearance and location throughout the site. With the exception of the homepage and the pages where forms are located (e.g. registration or feedback forms), top navigation bars must be present on each page. Any navigation bar that is found on the top of each web page must include the following elements: a distinctive, easily recognizable Site ID (or logo), a link to the various sections (or pages) of the site, and links to the search engine, home page, and utilities (e.g. Help feature). [24] Links are closely tied to navigation. The success of a link depends on two factors: how well the user is able to predict where the link will lead descriptiveness, and how well the user is able to differentiate the link from other links/ [25,26] From here, for the ACMS should provide right link with suitable labeling or information, so the users will know their navigation structure flow or direction.

System Flow of Control

The ACMS course description and listing interface will follow the principle of locus of control because it is presented in a same browser window. This arrangement may present ease navigational procedure for the Web users because they do not need to go back or forth of the registration system to select or change course tabs (General Studies, Year 1 or so on). All will be put within one browser to prevent them from navigation lost and confusion. However, the users can return to the previous registration page using the Back button if redo or change process on the courses is necessary. While for universal usability, it concerns on how to associate all the three

(3) main elements together to fulfill the universal usage features. If all the three elements can be combined and integrated together within a web-based application, it is good enough and capable of increasing the user friendliness concept at the same time, indirectly.

Database Usability

Database and Web integration offers a cost effective way to provide value added access to data stored at multiple locations through a Web browser. With the popularity of the Internet and intranets, an access to a large number of data that stored in Database Management Systems (DBMS) through the Web for electronics publishing, electronic commerce, and enterprise applications is increased. [36] According to a case study presented in [31], it is important that the student information is stored and manipulated in a manner which protects it from machine crashes. This concept should be implemented and practiced within 5 main database transactions algorithm which are Open, Read, Store, Close and also New.[31] Furthermore, this information should be made accessible from anywhere in the campus (internal system) or outside (external system), and kept consistent despite concurrent accesses. This will support my stand in ensuring that the database or information warehouse that is going to be developed or re-engineered soon should be designed in the correct way. This is a very good practice in avoiding system failure from the design architecture and database algorithm manipulation enhancement compared to the previous system used. If the design phase within SDLC lifecycle is utilized correctly, the probability of system failure or fault can be reduced and prevented. Most of the thing, the information should be accessible from everywhere since it implements web-based application using distributing computing concept; by mean the information should be accessible either within or outside of the UTP campus.

Security

Concerning about security issues nowadays involving web-based applications, there are some research done on how to best utilize the security measurements in terms of division concentration. [32, 33] Referring to [32], the paper discussed about several common classes of coding error generally encountered when auditing web applications running on the Active Server Pages (ASP or .NET) platform. However, there are only some portions of the paper in which attract my attention towards ACMS project study regarding security analysis. Input validation is one of the classes that emphasize on insufficient validation of fields in SQL queries that can be one of the crucial things in ensuring the security of the input, information and output of data by the database.

According to [32] also, by using the rich capabilities of SQL server and its range of built in stored procedures and extended stored procedures, it is possible for hackers to use the database server as a bridgehead into the back-end network that supports the ASP or ASP.NET application. Some of the suggestions or tips in overturning these SQL vulnerabilities are by looking for specific characters or words in the input that we know are dangerous. It means the validation control can limit or prevent certain characters that similar to what SQL symbols use also, from being inserted into form objects like text fields. This can avoid hacker from making some combination of Transact-SQL in accessing username or password of users in manipulating SQL functions; known as SQL injection. The disadvantage of this scheme is that we don't necessarily know what bad data looks like. On the basis of this paper, we could probably guess, but we might pick the wrong items for 'bad strings'. This is a very good idea in ensuring security of web application from the beginning stage via user input. In ASP.NET, there are some similar automated functions which are called as validation object controllers that disallow some formatted SQL symbols or characters from being used within user form objects.

"Session" Concept Usability

Poor credential management is one of the issues that related to state and session maintenance which is called credential management (parameters/arguments). It creates problems in this area in which includes plaintext usernames and passwords in query strings, form 'post' data or cookies. The idea on the paper is the fewer times credentials are transmitted, the better. It is generally bad practice to have any form of credential (username, password, session id or other arguments/parameters) in the query string of a HTTP request like we always see in URL address bar. [32, 33] This is because of the likelihood that an attacker will gain the ability to read the web server's log file. For a novice user, it would not be any problem but as for expert or intermediate system users (knowing web programming syntax and how it works), it will create indirect risk where they can read and possibly understand the parameters sent. If that so, they might know some of the database design or objects and will try to do some database manipulation or SQL injection.

SQL Injection and Preventions Methods

Research papers have been written on methods of obtaining the structure of a SQL\ server database using SQL injection and ASP error messages. It is possible to determine the value held in any field with a known name, the names of all fields of tables, and the names of parameters for stored procedures fairly easily, using only error messages. The resolution to this problem is to ensure that the errors returned by the production application contain the absolute minimum of information. Another causal problem is the pressure of development faced by developer; limited time frame. This will not allow them to tidy up their development project and might oversee some security elements due to time constraint. The resolution suggested within this paper is to make the quality of the code base, in terms of error handling, file locations, and credential handling, as important a part of the development process as the code itself. If an application is lacking in this area, management must allow the development team the time to 'tidy up'. From the overall idea of the security issues, it is concluded that preventing system error or failure from the

beginning stage via user input is much more efficient and advisable rather than error correction or troubleshooting which takes more time and cost.

Re-Engineering Method

ACMS is considered will undergo re-engineering process within SDLC lifecycle in its development tasks. Re-engineering the old Course Registration System to be something more meaningful and slightly better is not an easy task and I think the hardest compared to developing a system from the sketch. This is because re-engineering the existing system in which it is familiar by the users in terms of usability, interfaces or processes involved, it is hard to maintain or increase the system. The main concern is on how we can attract users' acceptance and pleasure with the new system in replacing the old system. Therefore, in [34], a framework for developing effective commercial Web applications were developed and described on how it works. Web application project success hinges on whether its intended purposes and contents are acceptable to the members of the target population in the context of the legal, political, economic and cultural environment of their society. For ACMS, it is a good guideline where the new system should be acceptable by the users in terms of usability, legal means on the information provided, and political acceptance by means accepted by all level of users (academic management until end users). Otherwise it is hard to implement the system into the intended environment. For ACMS, it should provide course registration process, able to be used by students mostly, providing legal information (courses) and suit with students' usability (not too complex and tedious).

LESSONS LEARNED

Some comparisons were made during the process of literature review on those journals and paper work. Among the comparison, it involved benchmarking and analyzing other course registration systems from other universities or colleges by using their manual and user guidelines.

University of Hong Kong

From a registration system observed from University of Hong Kong, it requires users to use students' ID or number to log into the system; by mean here, it still have some log validation control to grant user access. Then, the system will compare the course selections against the university regulations and pre-requisites for certain courses and warn students if the selections are not advisable for reasons such as non-compliance with the regulations or non-fulfillment. This is a good example of feature that the new ACMS system will provide as the main core change in helping ACS staffs stopping their manual work on determining a particular student course subject prerequisite. It is time consumption and need tedious work. By providing this feature, the system will do the subject prerequisite checking using course and student database and able to produce desired result.

Saint Mary College of New York

Saint Mary College in New York implement a course management system also in which has more feature inside it to make it more usable for many purposes. For example, when a student attempts to register for a class for which he/she is not eligible a "Registration Add Error" will appear in the area just above the "Registration Notification / Status" area to indicate the status of that particular subject enrollment or registration. This will alert student if any error occurs and capable of preventing invisible problem unknown to students or ACS staffs. For the system, like Hong Kong University, the system login information is required for entry into registration which is called as "Registration Alternate PIN". The

"Alternate PIN" is the terminology used for the Registration PIN. The "Alternate PIN" is the PIN received from an academic advisor or department to be used for registration. Students must make a Registration Alternate PIN in order to allow them to log into the registration system to register, add or drop for courses. Another feature is the Search function provided which allows students to directly find a particular course name instead of wasting time browsing looking for the right course name required. This might be an alternative solution or option to students whereby they can find the courses they want to register for through multiple ways, not only by browsing the site. This can save registration time; mostly spent on searching right course name and code.

Drake University

In Drake University Internal System, it allows students to view the class schedule first before they want to register for courses to see the timetable. This is to avoid the clash problem soon once the semester started. This a new improvement to be made into new ACMS system by providing early course scheduling timetable, so students can plan their time management and tutorial classes and also able to avoid from burdening lecturers to change back their class time to suit with students and to avoid clashes. Same application with other web system, it also requires user login profile but for their system, they make use of student ID as the username and the individual password. This implementation is much easier by using student ID in which we can reduce the space and time needed to store new type of login username other than for E-Learning or Novell system on the database. The system will also notify users instantly through pop up message or red stop sign if there is any problem or error occurs during the process of registration, add or drop courses. This is a very good feature that capable of detecting process problem and let the user knows instantly unlike the system we are having now.

Results and Discussion

From the comparison made on those three different course registration systems, it is concluded that this review is very important in order to evaluate how other system works and their features. The main result from this benchmarking is the ability to make the system fully automated by its own without or making less human interference process. The manual process should be reduced or eliminated at all and the ability to provide system error notification to users if their process having problem or not correctly processed with the appropriate error log report.

CHAPTER 3

METHODOLOGY / PROJECT WORK

3.1 Methodology

A good and suitable process model is essential to the success of developing a good software product by precisely defining the processes needed for guiding the developers. The methodology of the project initiation, design and development throughout the project development life cycle is quite simple and easy to be followed as it is constructed accordingly to the basic fundamental of Software Engineering learning theory and knowledge.

3.11 Software Development Life Cycle (SDLC)

The project development life cycle that will be used for the whole project starting from the beginning until the end is the SDLC (Software Development Life Cycle) in which implementing the 'Waterfall Model' concept. The model is taken as the basis because it takes the fundamental process activities of specification, development, validation, and evolution and represents them as separate process phases such as requirements specification or identification, software design, implementation, testing and so on. More over, this model is widely used for practical system development. There are five (5) different principal stages of the model map onto fundamental development activities. The stages involved are as below:

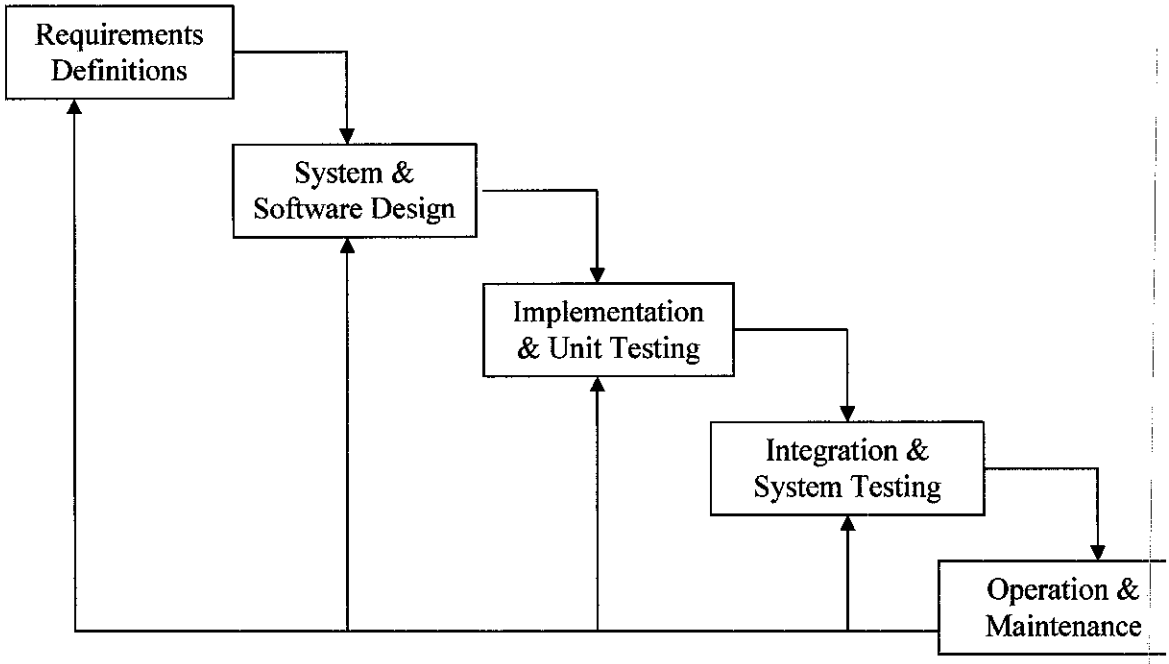


Figure 3.1 Software Development Life Cycle Model Diagram (SDLC)

The reason this model is chosen because of its simplicity in guiding the whole project development processes starting from the initiation, design, development, testing and implementation. It is also more organized structure rather than other process models and mainly used for developing new software or system when all the stages scopes are well defined. It is also a simple management model and its separation of design and implementation able to lead to robust systems, which are amenable to change. Furthermore, each stage can be preceded from one phase to another and reviewed at the end of each phase whether to proceed to the next step or to return back to the previous phase for improvement.

3.1 PLANNING / REQUIREMENT DEFINITIONS

For last semester, the FYP Part I was already completed as requested and successfully implemented. Starting from the planning stage, one of the tasks was initializing and defining the system specifications and requirements for the prototype project. The software specification process was done in order to define and identify the functionality of the software and constraints on its operations. The specifications and requirements were divided into two main sections which were the functional requirements (concern on system actual functionalities) and also the non–functional requirements (concern on the system overall task performance and attributes). These can be further elaborated more by below section:

Functional Requirements

Functional requirements concern on the system functionalities or services that the system is expected to provide such as input, process and the output. The attributes of these requirements are as stated below:

Student:

1. There should be 3 main entities as the users (Student, Lecturer and Admin)
2. The system should be able to perform as many automated system as possible in reducing human interventions by integrated database relations between student database, course subject database, co-curriculum database and admin database.
3. Student should be able to perform basic registration procedures such as Course Registration, Add/Drop and Confirmation processes.
4. The system should be able to check course subject pre-requisite and decide whether student can register the course or not
5. Classification of student status either Active (normal), Dismissal, Under Probation (first warning) or Probation (second warning) which will affect their acceptable or allowed maximum credit hours to be registered for courses.

6. Students can perform and submit their course registration or add/drop form as many times they want within the specific procedures session time period.
7. A counter for credit hours registered should be provided to guide registration process by students and able to limit student from exceeding credit hours allowed.
8. Student should be provided with lab registration module or form to allow them to register their lab sessions for a particular subject that has tutorial or lab class.

Lecturer

1. Lecturers should be able to login in as unique users and have their own modules.
2. Lecturer should be able to check the latest list of registered students (names and student IDs and numbers of them) for that particular course taught by lecturers.
3. Lecturer also should be able to check the number of registered students for lab sessions available earlier to ease their teaching material preparation.

Administrator

1. Admin should be able to perform course registration or add/drop processes for students.
2. Admin have the access to course subject database and able to edit the database information via online using web based application provided.
3. Admin can set the process sessions accessibility for course registration, add/drop and confirmation by students
4. Admin doesn't bounded to the session time set for all processes but instead have free access to all of them at any time they want either before, within or after the time session allowed.

Non-functional Requirements

Non-functional requirements relate to the behavior of the system in its operational environment. The attributes of these requirements are as stated below:

1. **Reliability** concerns on the probability of the system to fail within the operational process under specific time period. It should be able to provide high availability (almost all the time) for users to perform their tasks when system is needed.
2. **Speed** concerns on the time taken in processing transactions per seconds including the user or event response and the screen refresh time. The system should be able to speed up user's performance rate within specific time period for any transaction and provide faster data retrieving processing and displaying.
3. **Ease of use** concerns on the easiness level of users to get familiar with the system by making use of their knowledge, experience or skills transitions from the previous system. It also concerns on training time needed and friendliness concept enhanced so that the level of easiness usability newly introduced won't make the users turn into more difficult time but instead feel more pleasure.
4. **Robustness** concerns on the percentage of events causing failures for the system process. It should be designed where each module or process is independent from each others so that the rate of system failures caused by too much dependant between processes by their relationship could be reduced.
5. **Usability** concerns on the usability of all the functions provided inside the system. All the system should be usable for that particular user type (student, lecturer or admin) and not usable or non-working functions should be avoided.
6. **Delivery** concerns on the delivery of the data and information for users. The delivery should provide the only needed data or information and the input or output of the process should be visible and satisfy the users' needs.
7. **Dependability** concerns on how good the system should perform the requested processes with high successful rate and no failure at all. It should catch the users' trust by relying the system to exactly perform their process correctly.

8. **Integrity** concerns on the integrity of the information and data provided whereby the most updated data should be displayed and well-communicated with other processes that shares the same data. Integration is s must since it affects how the modules work with each others and their relations.

All the listed functional and non-functional requirements are taken into consideration along the project development tasks carried out. They will be the main elements of the project target and always be reviewed during initializing and rephrasing stage. The project schedule was also developed in order to guide the development time constraints and serves as the target. Planning stage was a bit long because thorough analysis and considerations need to be done before starting the project work. The planning is including the target users, potential system users, environment, workflow, system processes, modules to be enhanced or improved and how to really develop the working system using existing technology, knowledge and skills.

3.2 DESIGN

In terms of design issues to be discussed, there are 3 major parts will be explained which are the system design (UML), database design, and interface design. These designs are interrelated between each others in contributing towards the victory of this project.

System Design

In this section, design task involved will be discussed in further detailed by emphasizing on several basic design layouts for this system which are the system architecture, system flow diagram, use case diagram and DFD diagram. For describing the system basic design, UML or use case diagram is decided to be presented in this report in order to brief and give overall ideas and general understanding on how the system work, functionalities, numbers of users and the accessibility features granted for each user (student, admin & lecturer).

System Architecture

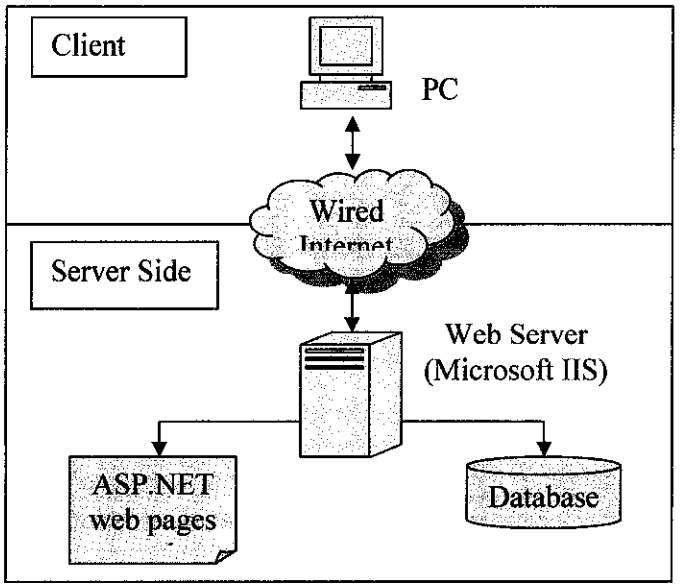
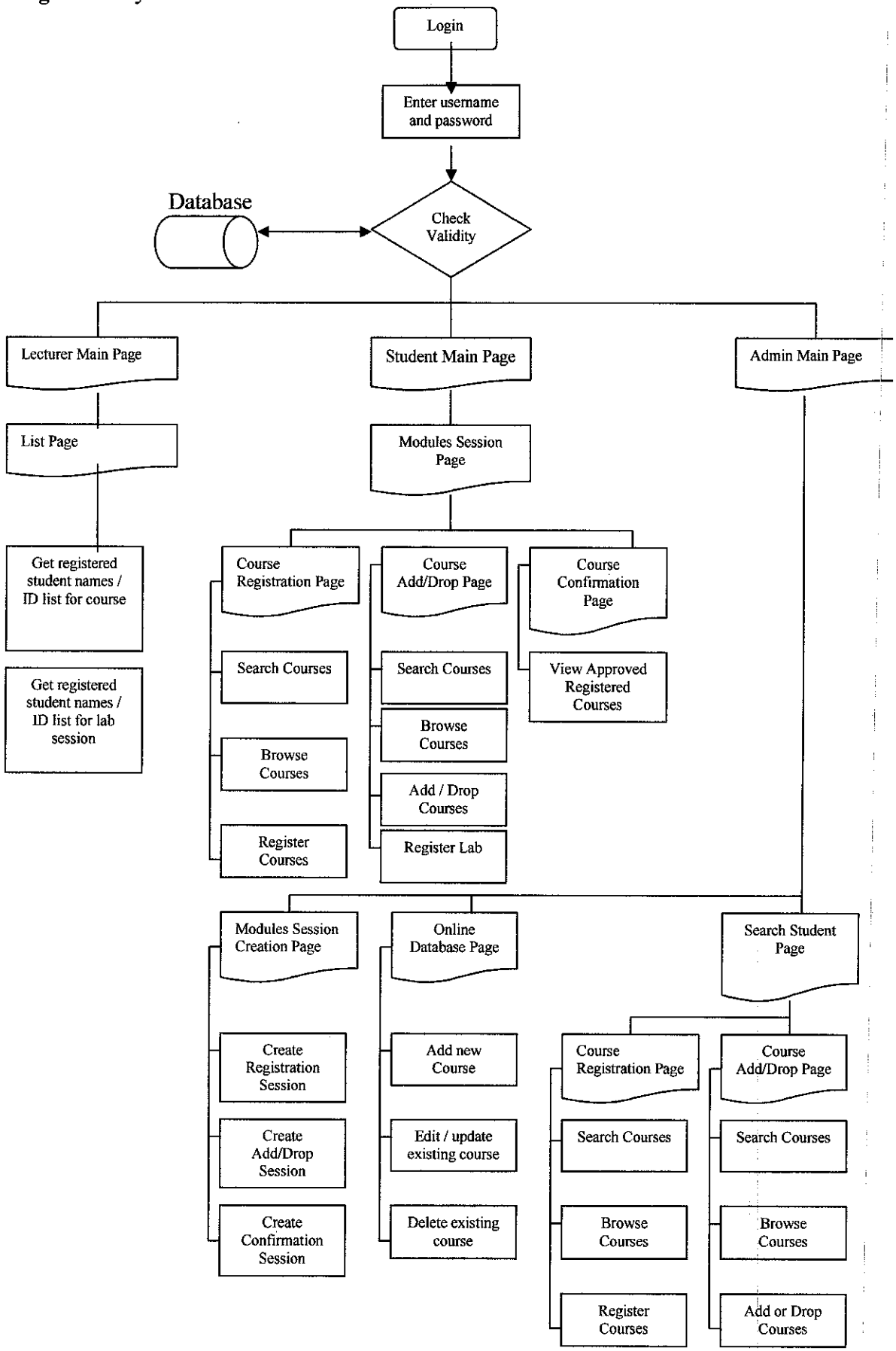


Figure 3.2 System architecture for client and server side

The diagram shows and explains the system architecture for the ACMS in which consists of the client and server side. In client side, the users (student, lecturer and admin) will be using the personal computer or PC to access the system via online using wired internet connection. While the server side will be the web server located in the education institution (for this case scope, UTP is the institution) in which running on Microsoft IIS.

Once the users get connected to the system, they will be able to retrieve HTML pages containing information required by submitting HTTP request on particular HTML web pages served or stored by the web server. Request sent by the user will be processed in ASPX engine and the result will be passed to user browser. While for database, the ACMS system makes use of Microsoft SQL Server 2000 as the storage platform in which the data or information needed will be retrieved and stored into the database according to the respective table name and attributes. Most of the ASP.Net pages will need some information such as course name, code, student information etc. to be included inside the page and here will be the moment where the data will be fetched from and stored back into the database when any update occurs.

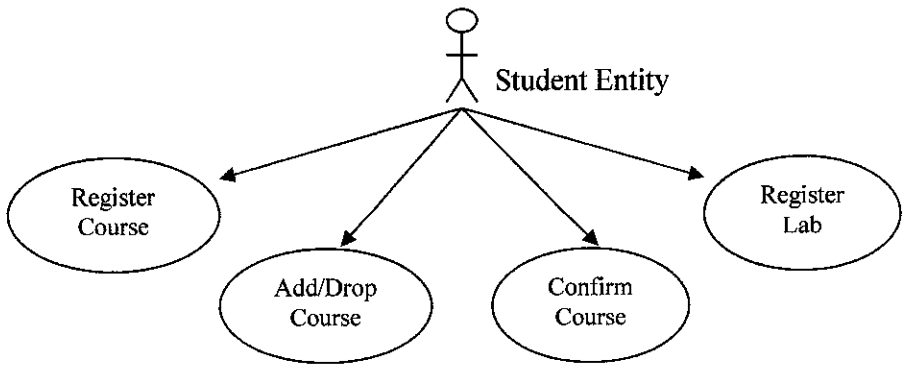
Figure 3.3 System Workflow for ACMS

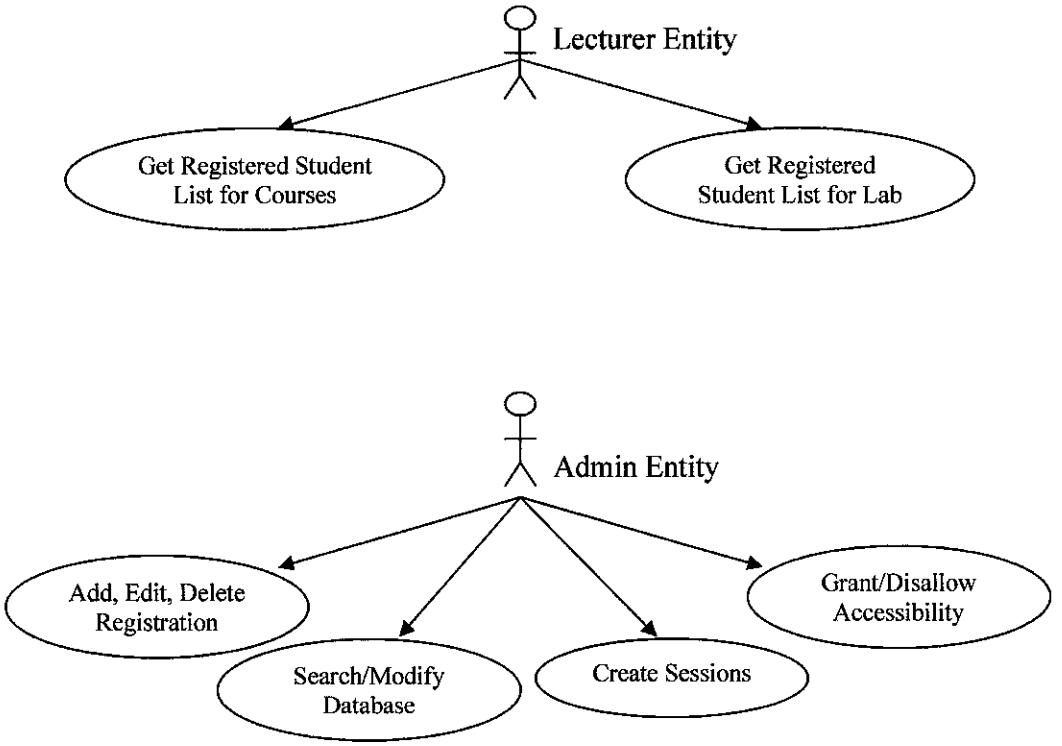


Use Case Diagram

Use case diagram shows the interactions graphically between the system and the external users (entities). By having this diagram, it gives an overall view or idea of what the system does and who will be using the system. As can be seen from the diagram, within this system, there are three main entities involved which are the Student, Lecturer and the Administrator.

Student entity is the one who will perform all the processes starting from registering course, add/drop, lab registration and also check for confirmation list. While for lecturer, they are the user who can only get the list name of registered students either for the course(s) that they are teaching or for the lab sessions. As for administrator, they are the one who will set the process (registration, add/drop or confirmation) sessions to student entity in which at the same time, control the accessibility (grant or disallow) of the users into the system. Besides that, they also can access online database information via web based application and can perform course registration or add/drop for students by referring to their student ID. In below section, there is brief description of the roles and functionalities available for each entity that exists in the system. The description is as follow:





In order to provide better understanding and bigger scope, a more detail use case diagram is illustrated in the next page section with the intend to detail out the system relationship with its entities involved as a whole complete and more complicated system.

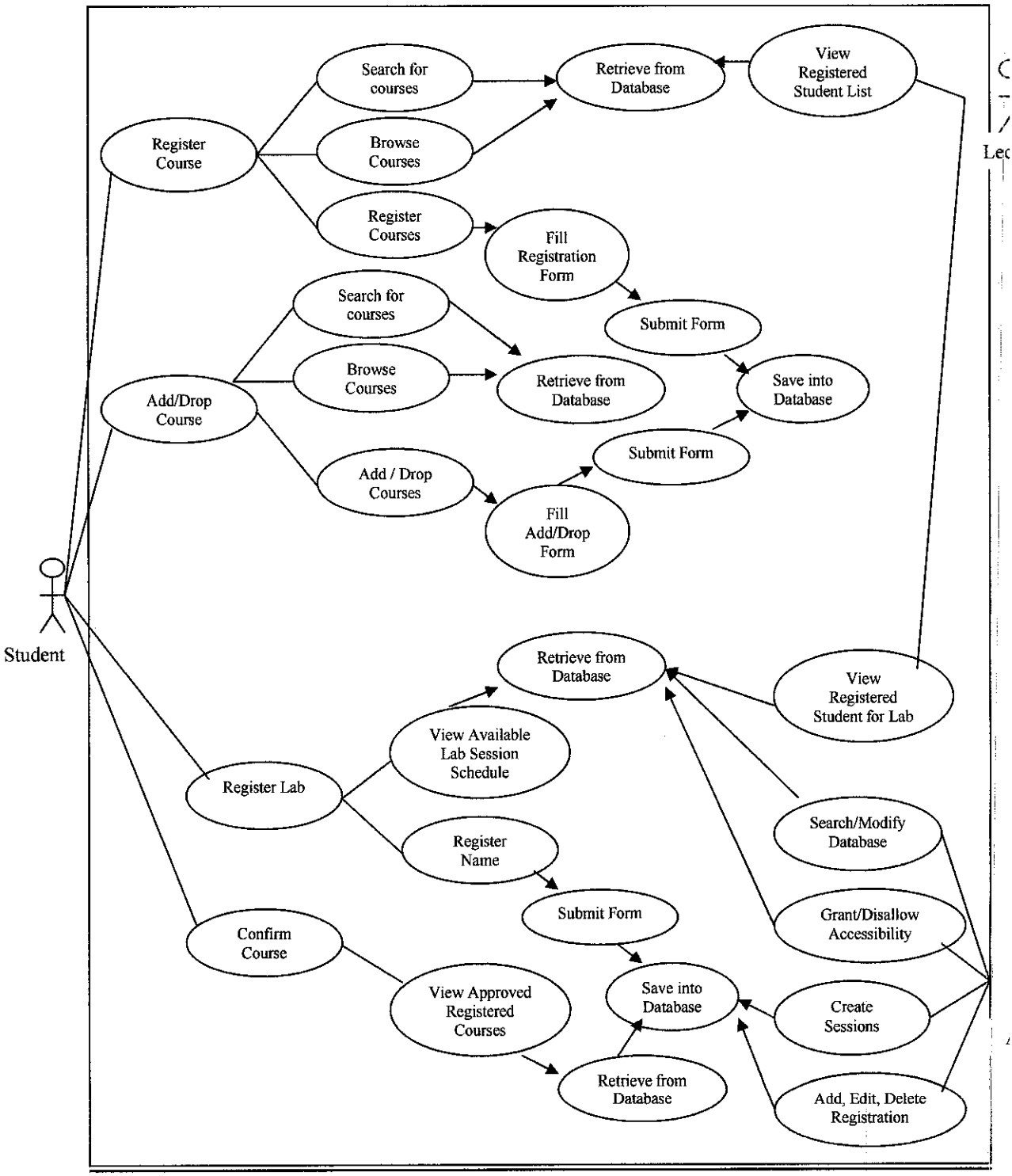


Figure 3.4 ACMS Use Case Diagram

Data Flow Diagram – *Context Diagram*

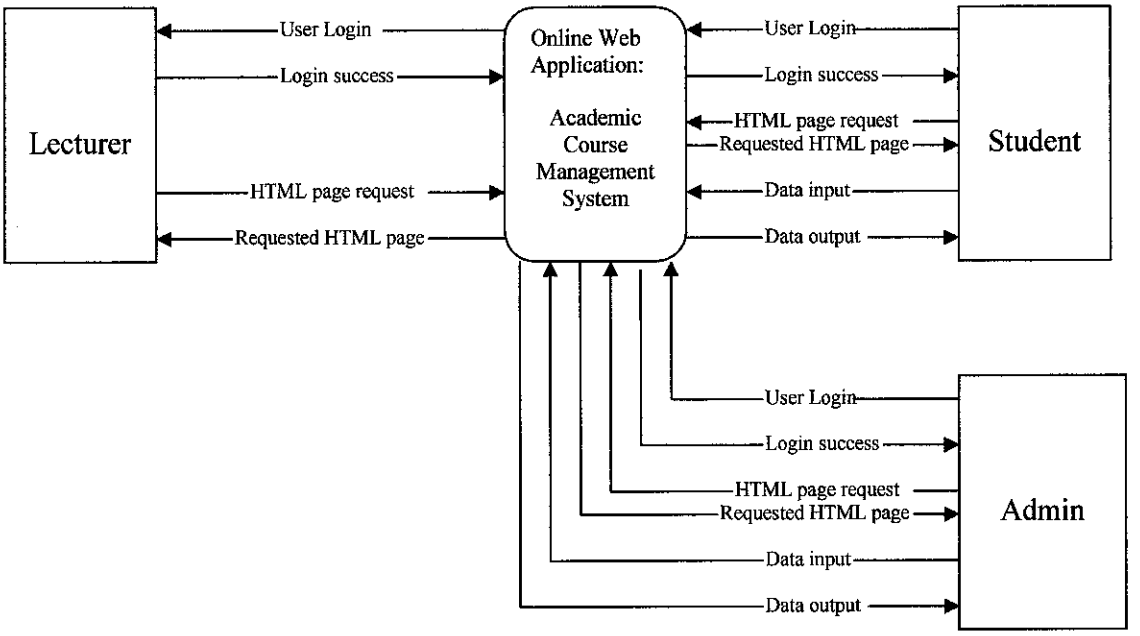


Figure 4.1 Context Diagram level 0 for the Academic Course Management System via web based application

The data flow diagram level 0 as above depicts the data flow of the ACMS via web based application. It shows all the data flows which flow in and out of the system. The rectangular boxes with sharp edges represent the external user or external entity which is not part of the system, while the rounded edges rectangular represent the whole ACMS system; including its functions and processes. For a good context diagram, the amount of data inflows must be tally with the total amount of data outflows, which are emphasized by the author. As the diagram illustrates, the external entity that communicates with the system will the student, lecturer and ACS staffs.

Data Flow Diagram – *Level 1*

The data flow diagram level 1 is the expansion of the context diagram level 0, as we go on into the system. From the figure 4.1, we can see that the process has expanded into 6 more main processes. All the 6 processes constitute the whole system in the level 0; these are the main processes in the system, where each individual process has its own function. Each individual process will be expanded and explained further in the following sections.

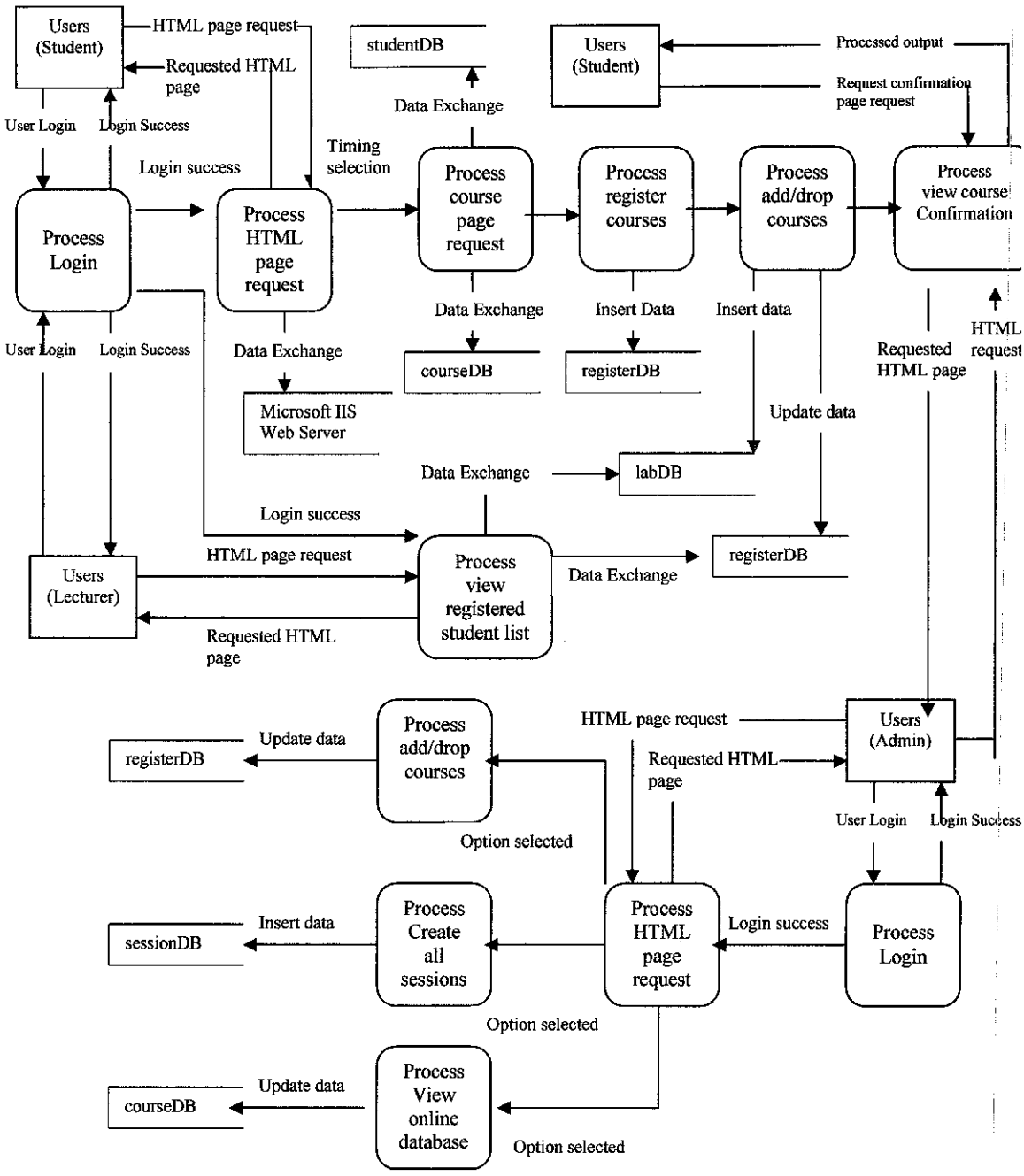


Figure 4.2 Data Flow Diagram – level 2 on Process Login (process - 1)

Process 1 – Process Login (Level 2)

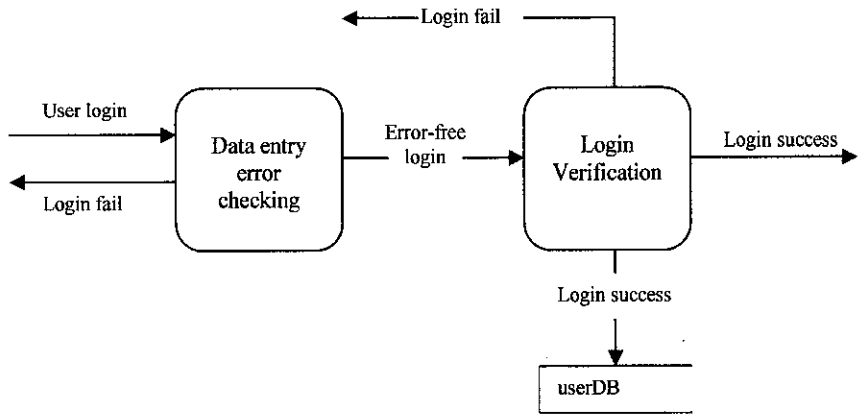


Figure 4.2 Data Flow Diagram – level 2 on Process Login (process - 1)

From level 1's process login, this process is further expanded into level 2 that is more detail and thorough activities involved. User's login will be validated against any data entry error or non-meaningful data entry in the 'data entry error checking' process. Only meaningful, valid and error-free login is passed to the next process, which is the login 'verification'. This is where user login will be verified with data from the database.

Process 2 – Process HTML Page Request (Level 2)

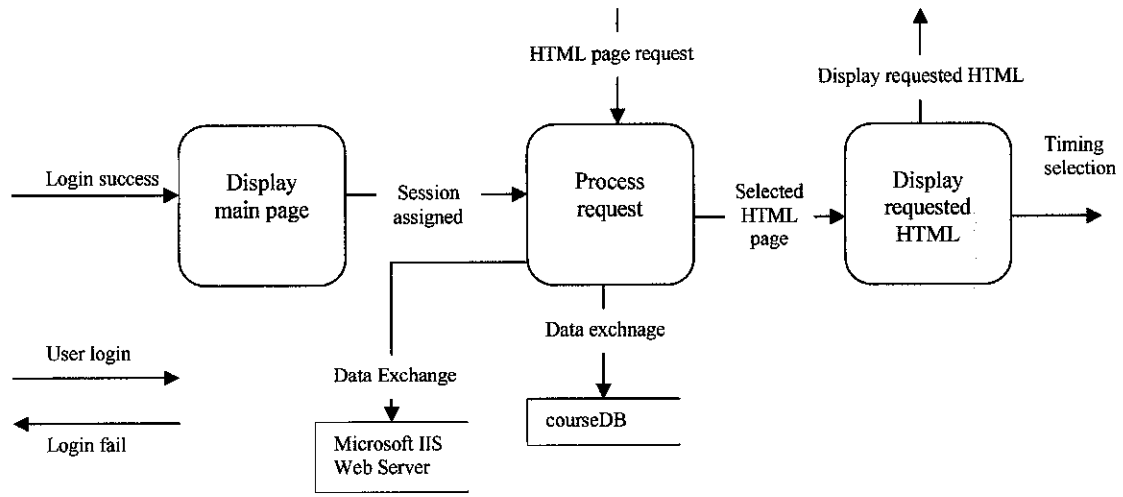


Figure 4.3 Data Flow Diagram level 2 on Process HTML Page Request

In the level 2 process, successful login will execute the 'display main page' process. From there users can select the navigation they wish to perform from the hyperlinks available in the main page. And the selected hyperlinks will be processed in the 'process request' section where requested pages will be retrieved from the Microsoft IIS Web Server and will be displayed to the users. From here users (students) will also be redirected to 'Course Registration' or 'Course Add/Drop' or 'Course Confirmation' depends on the request they made. For lecturer, they will have only two options that is either to view registered students for course subject or to view registered students for lab registration. As for admin, they will have 3 main functions hyperlinks which are the online database, session creation module and also course registration for students.

Process 3 – Process Course Page Request (Level 2)

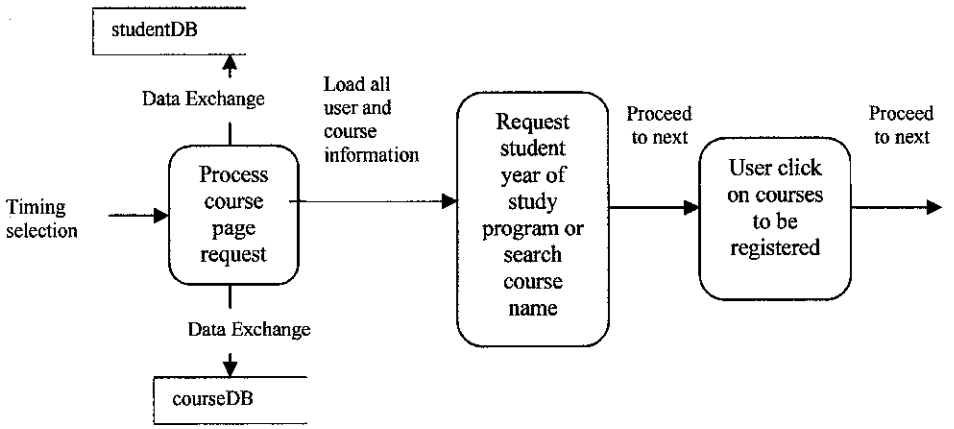


Figure 4.4 Data Flow Diagram – level 2 on Process Course Page Request (process - 3)

In this DFD, it is all about the pre-registration process that happens in the system. According to the timing selection, each module for students mainly will be allocated to be visited or executed by users. If the login profile is matched, a landing page will retrieve and load information from student and course subject database tables to be viewed in the page. Once all the default information is readily retrieved, users will need to either select their year of study program or they can search though search function provided in order to view available courses for registration. Once all the necessary information is loaded, the user can click on the courses that they want to register and the next process will be redirected to another new process.

Process 4 – Process Register Courses (Level 2)

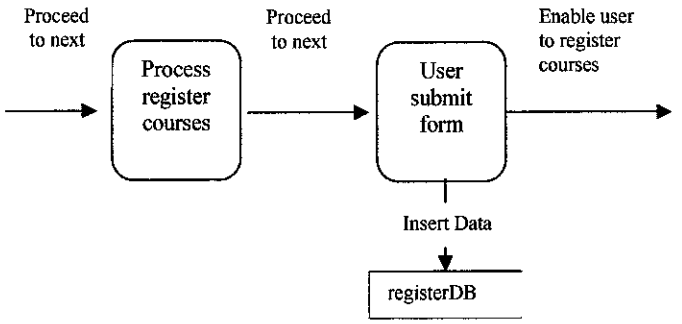


Figure 4.5 Data Flow Diagram – level 2 on Process Register Courses

This DFD looks much simpler in term of the process because it only involves submission of the form filled by the users to the database to be processed or saved. From the data loading, the registered courses will be put into a buffer to keep those pre-registered courses for temporary purpose and after that, once pre-requisite checking is valid, then the data of transaction (selected courses) will be directly stored into student academic database.

Process 5 – Process Add/Drop Courses (Level 2)

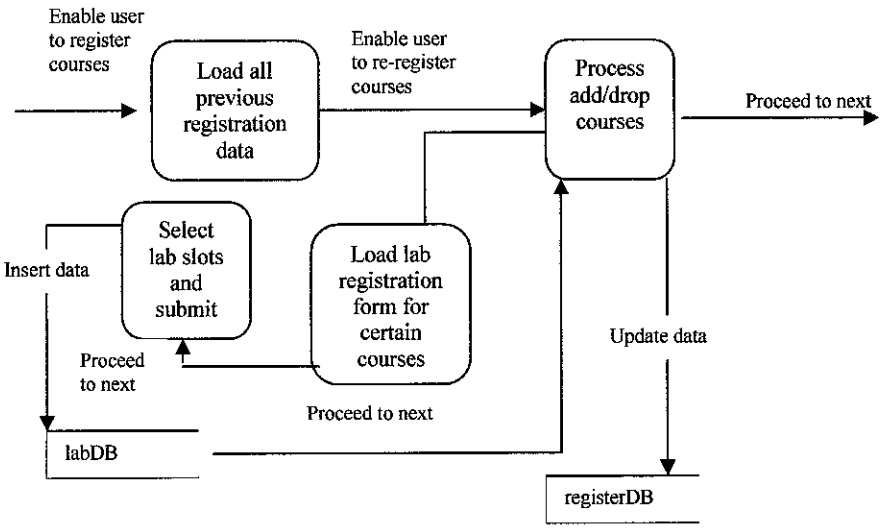


Figure 4.6 Data Flow Diagram – level 2 on Process Add/Drop Courses

As for add/drop process module, it is similar with the course registration process but however, the information that the system will load will be the combination of student profile, the available courses information and also the record or previous registration process (transaction). From here, students can make correction if any change occurs. At the same time, if the course subject has lab session or tutorial classes, the system will load lab registration form for certain courses. And users can view or select lab session slots available and then submit the form or request. This new information will be stored into lab/tutorial database table once the users submit the form.

Process 6 – Process View Course Confirmation (Level 2)

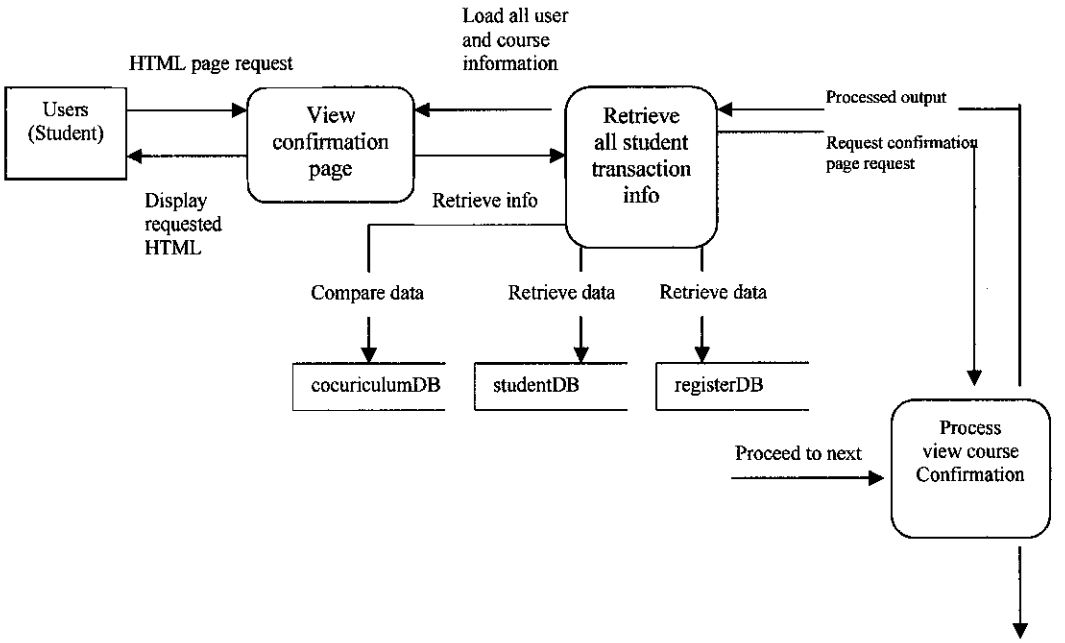


Figure 4.5 Data Flow Diagram – level 2 on Process View Course Confirmation

Process view course confirmation is the process where students will be checking or validating their previous registration process done by confirming the data presented in the system. When it is necessary, if the login profile is valid, the system will retrieve all student transaction information such as the student ID and the courses selected. In performing this function, 3 database tables will be used which are the student table to load the student profile in page loading, registration table for retrieving back the previous registered subjects and lastly data from co-curriculum

table. Once every data is processed and retrieved, they will be displayed in the confirmation page.

Process 7 – Process Registered Student List (Level 2)

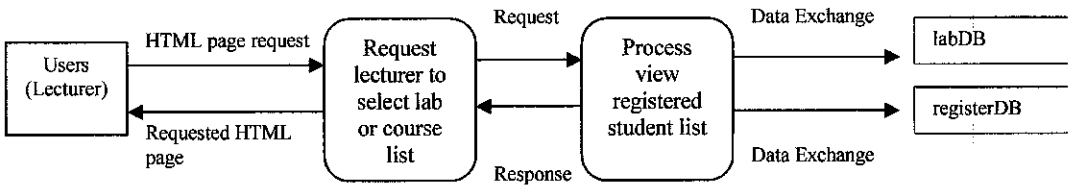


Figure 4.6 Data Flow Diagram – level 2 on Process View Registered Student List

This DFD refers to lecturer who will be able to get the list of registered students for courses that he/she will be teaching and also the chosen tutorial / lab sessions. Once the lecturer able to log into the system, they will need to select either to view course or lab registration information using the dropdown list provided in the system. Inside the page, it will just list the student name, ID and also the subjects or lab registered (from database tables) within page(s).

Process 8 – Process Create All Sessions (Level 2)

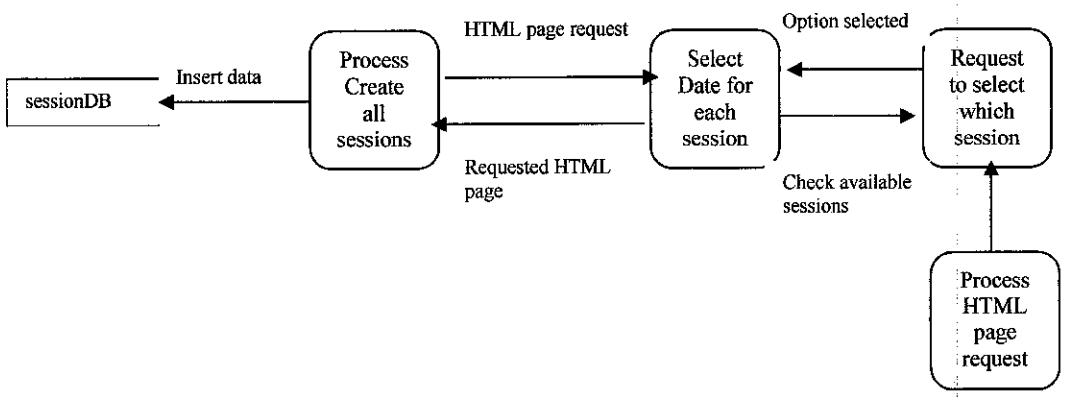


Figure 4.5 Data Flow Diagram – level 2 on Process View Course Confirmation

As process 8 indicates, it is used by the administrator to assist them configuring the system student processes begin. Once the login is valid, a HTML page will be displayed together with the sessions to be selected and their dates. This part will be used as to set the date and time for each session. In here, they need to make sure that all session timing is filled and then they will be submitted to the session database.

Process 9 – Process View Online Database (Level 2)

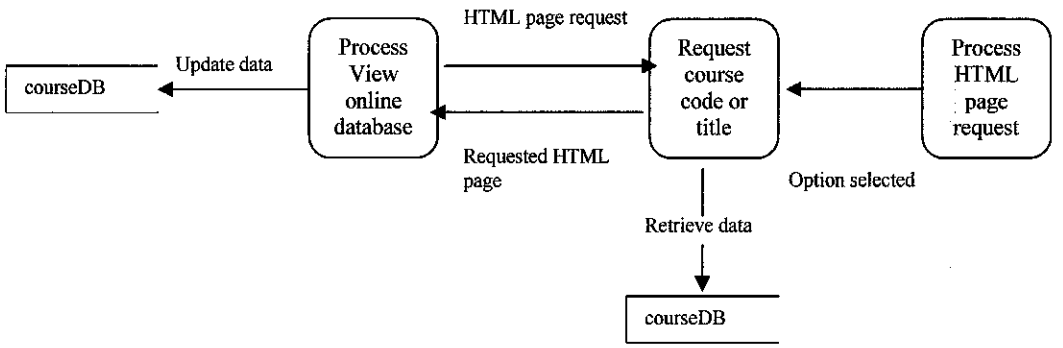


Figure 4.5 Data Flow Diagram – level 2 on Process View Online Database

The DFD explains that in the process of loading HTML page, all information is retrieved and pointed directly from the course database table. Every single course subject profile will be listed according to the choice, made by the user. Admin can just search for the course title or code to get the data and these data is retrieved directly for viewing in the system. If any update or changes need to be done, these data will be updated into the database and the latest information will be kept.

Interface Design

After designing the system through diagram representations like system architecture, system flow, use case and data flow diagram, the author can then proceed to the next step in which designing the system interface. System interface is medium channel where it communicates the users with the system process or functionalities. Interface design is the realization of the actual system design and will affect the way users can use the system in terms of user-friendliness and the interaction between system and users. A good interface design will be able to prevent and reduce information misunderstanding, frustration, dissatisfaction and also other usability problems. Therefore, it is important to have a good, effective, simple and user friendly interface design. But in order to have a good interface before we start developing the actual system, we need to plan properly and sketch good design layouts or storyboard. Based on the system entities with their respective modules identified, the author can start designing the interface for each page. The following illustrations are the system interface designs that are designed by the author according to the modules identified.

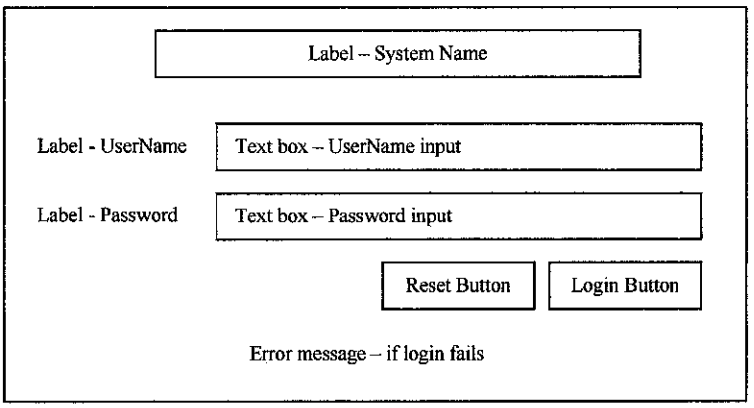


Figure 3.4 Interface design sketch for Login Page

The figure shows interface design for login page that will be used by users to enter into the system. The page will only require users (student, lecturer or admin) to key in their username and password in order to identify their accessibility level and authorization. Based on the type of user, they will be redirect to different landing page set by the author/developer. Basically, this login page design applied to all users and there won't be any different for any of them.

Student Entity

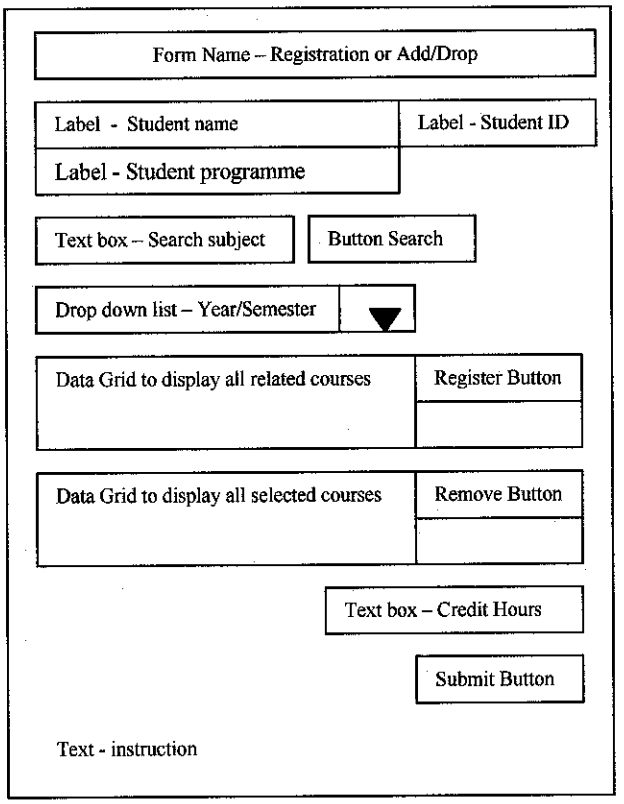


Figure 3.4 Interface design sketch for Course Registration and Add/Drop Modules

The figure shows the interface design for both Course Registration and Add/Drop forms that will be used by students to perform their registration process via online. Both Registration and Add/Drop modules will share and make use of the same page layout. When either one of the modules is called, the form title label at the top design will by changed by the system automatically according to the called module either Registration Form or Add/Drop Form. This is to ease the development tasks and saving time cost in designing the page. The another reason is to ease the editing purposes if in future the page need to be upgraded or improved, so then the editing part will only affect on one page.

This layout design also will be included into one of the Admin's modules where the Admin can perform course registration or add/drop process for students

(for special or exceptional cases). This page is very crucial to be developed and it takes plenty of time in development work.

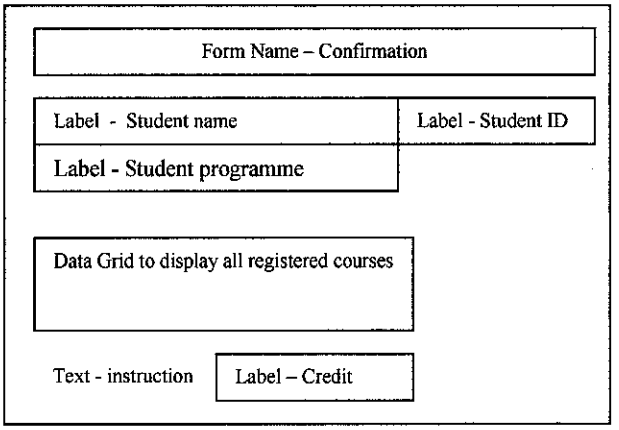


Figure 3.5 Interface design for Course Confirmation Module

The above figure show the interface design for Course Confirmation Form, which is used to list and confirm with the student all the registered courses done using previous Registration Form. This module design will only appear after the Registration and Add/Drop period session end. All the information will be read-only format and cannot be edited by users by any means. This page is just the information display and all the information in labels regarding student profile like name, ID and programme will be retrieved from student database. While for data grid that is used to display all the registered courses, the information will retrieved from student registration and course database tables.

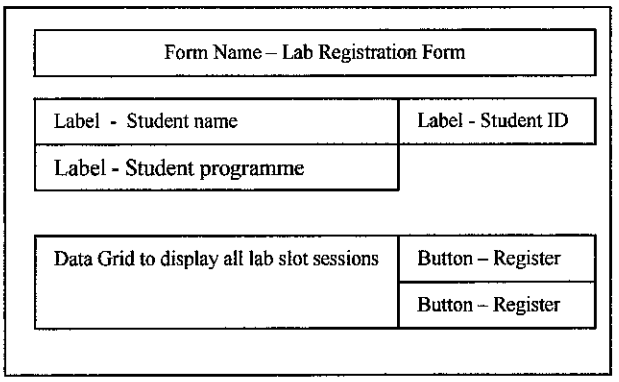


Figure 3.5 Interface design for Lab Registration Module Main Page

The above figure shows the interface design for Lab Registration Form which is one of the additional features provided in order to enhance the system usability. It will be used by students to register their lab session for course subject that has tutorial or lab classes. Currently, student has to manually fill in lab forms by writing their name and ID and somehow it is a hard time when the number of registered students are exceeding the lab capacity allowed. This lab registration form will be able to control the number of registered students by implementing counter to identify maximum capacity allowed which will be retrieved and set by referring to the Lab database table. Register buttons are provided for each lab session to allow students to submit their name and ID to the database record. Register buttons are provided for each lab session to allow students to submit their name and ID to the database record. Inside the data grid, it will list all available lab slot sessions available within that particular subject including the day, time (start and end time), number of students registered and number of capacity left. It will be a simple process and will contribute problem solution to both students and lecturers in future.

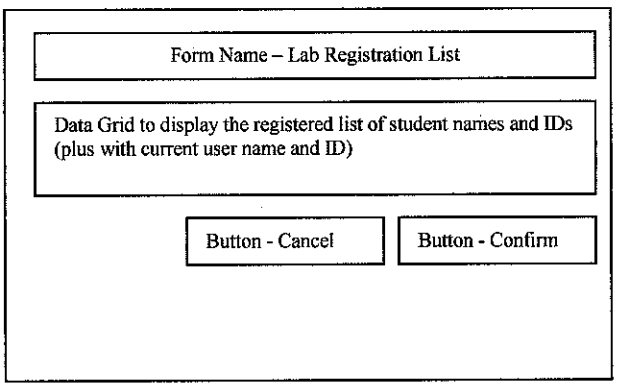


Figure 3.5 Interface design for Lab Registration Form

This interface design as above is used to display the list of registered student names and IDs for that particular lab session slot. The list will include the name and ID of the current user and a Confirm button will be provided as to confirm the decision making by student to register their name for that lab session slot. If he/she wants to cancel the registration, Cancel button can be clicked to return them to the Lab Registration Module Main Page.

Lecturer Entity

Inside Lecturer Entity modules, there are only 2 features provided which are the page for viewing the list of registered students for that particular course subject the lecturer is teaching and also the list of registered students for lab session slots. By having these features, the lecturer can get the estimation list earlier and enable them to prepare lecture materials and schedule for more effective planning and delivery. Lecturers are not provided with the ability to key in data or input but instead they will only get the list of student names and IDs from database regarding number of registered students for the course subject and also for the lab sessions as well. Two figures are provided in below section in order to clarify the explanation above. The figures are as follows:

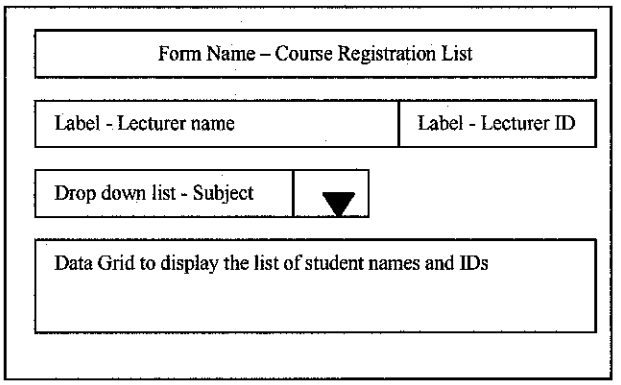


Figure 3.6 Interface design for Course Registration List

The above interface design is the page for displaying the list of registered students for the respective course subject taught by the lecturer. The dropdown list is provided for the lecturer to select the course subject that he/she wants to view and the data grid will display the data and information needed.

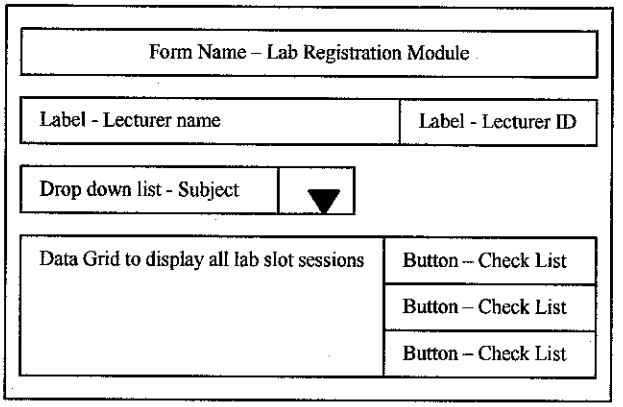


Figure 3.7 Interface design for Lab Registration Module Main Page

The above interface design is for allowing the lecturer to choose the course subject which the lab session is available. This is eased by using the drop down list provided. When the button is clicked, it will list down all the available lab session slots for that particular subject. A button also is provided to be clicked in order to allow lecturer to be redirected to another form to check or view lab registration list in which previously used by students to register their lab session slot. In the registration list, lecturer will see the list of student names and IDs. The lab registration list page will be as below:

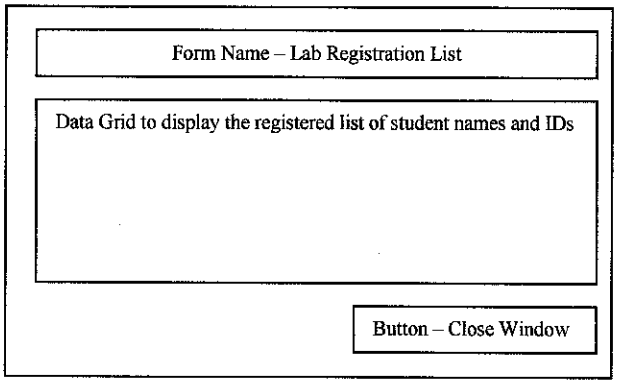


Figure 3.8 Interface design for Lab Registration Form

In the above interface design, which for list the registered students for lab session slots, the data grid will display all the necessary information like student names and IDs. Lecturer cannot perform any data key in or other process. They will only be able to just view the list in which this feature is not provided to Student and Admin

entities. A button (Close Window) is provided for them to close the window display and return to the previous page.

Administrator Entity (Admin)

In administrator entity, there are 3 main modules provided in order to allow the administrators (ACS staffs) to have the control over the process done by students. This can be said as a part of system monitoring and evaluating tasks since if any problem occurs, admin will be able to make troubleshooting and solve the problem. In order to really develop these features, admin pages also have its own interface design before the actual system is developed in order to generalize the whole admin system integration and relationship. The interface designs are as on next page:

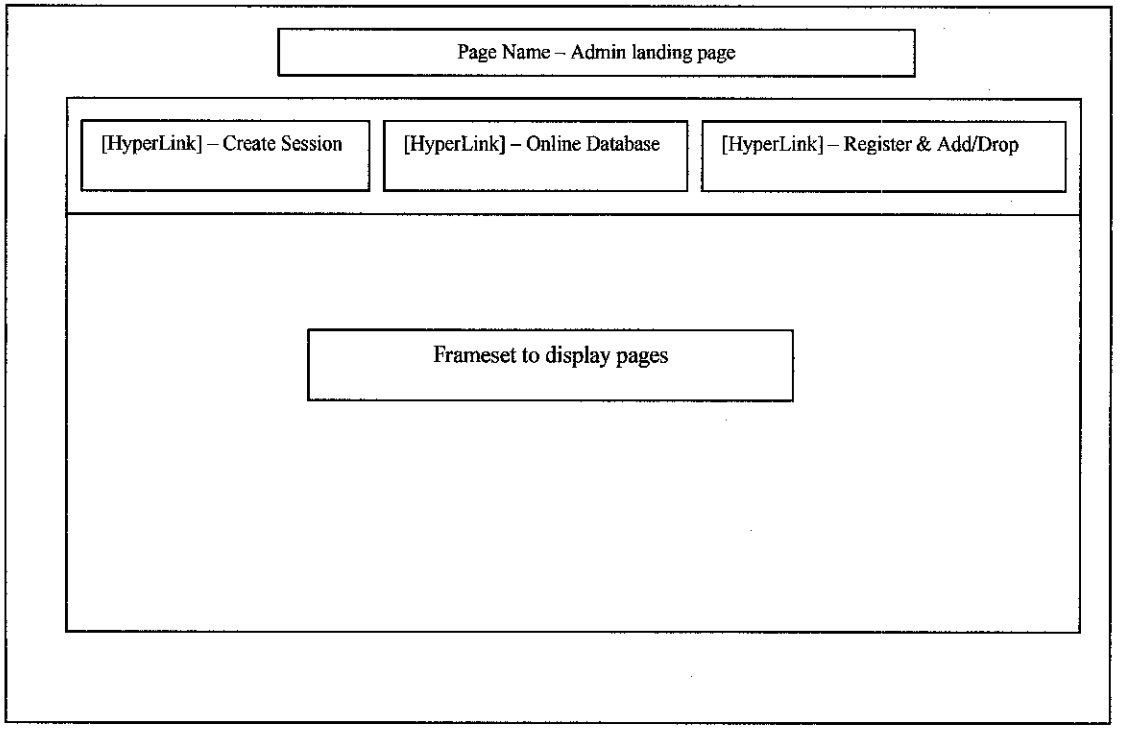


Figure 3.9 Interface design for Admin Main Page (landing page)

As illustrated above, this interface design is for Admin entity modules system. There are 3 hyperlinks provided which will ease the admin to go on any modules that he/she wants and the display will be viewed in the frameset. The frameset is used to view

the web page within on display screen and without the need to open or redirected to other windows.

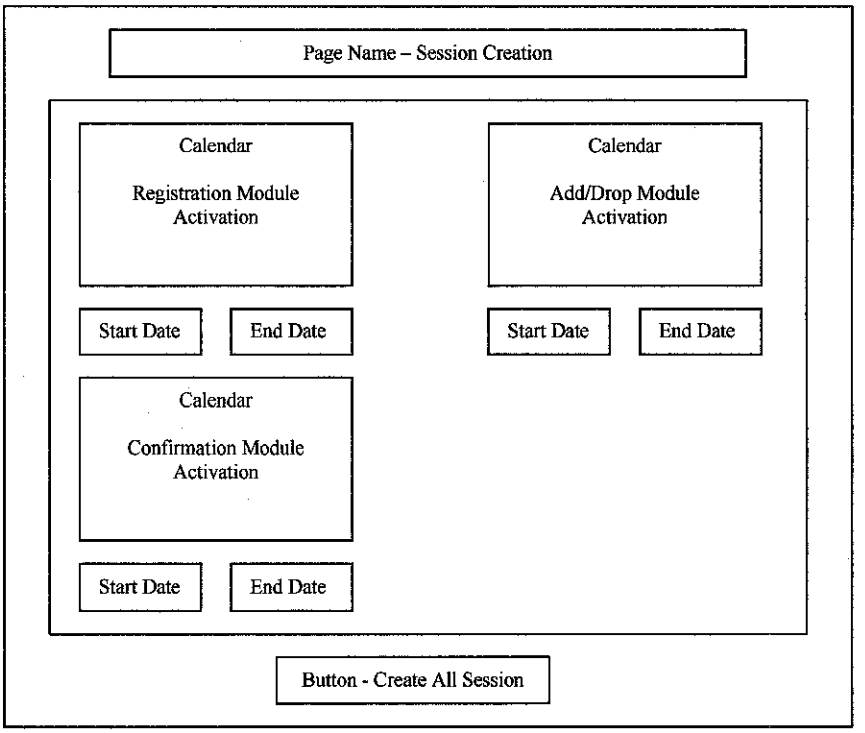


Figure 4.0 Interface design for Session Creation Module

This interface part is the design for Session Creation Module within Admin entity. It is used to create all the processes (course registration, add/drop and confirmation) that students will perform later on when the sessions are open for transactions. Each process will has its own calendar for admin to choose the dates as the start date or end date for the session. Each session of process must have a definite time period and it depends on the admin to set them. When admin click the date on respective calendar, admin must click either start or end date buttons to store the date in buffer. When all creations are created (assume that all sessions are already set and planned by admin), admin can click 'Create All Session' button to send the data in buffer into the real database.

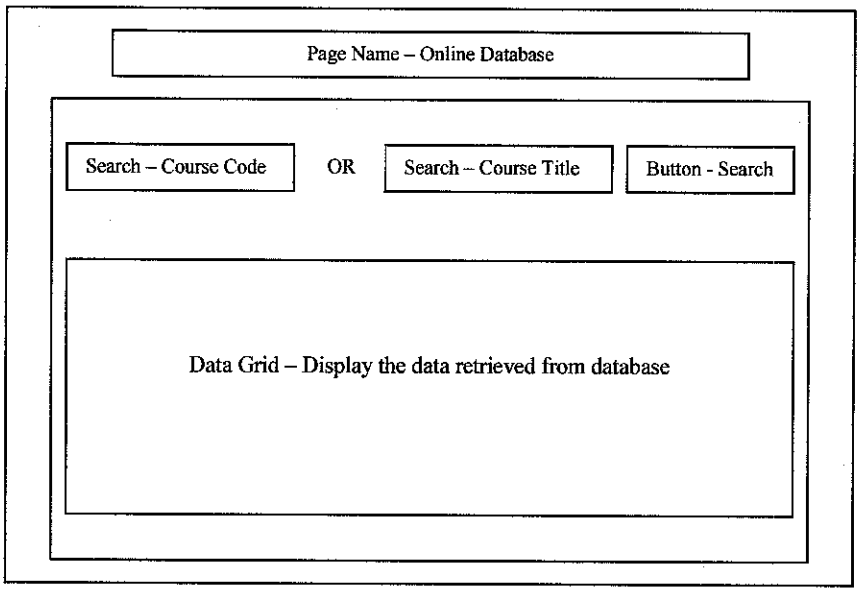


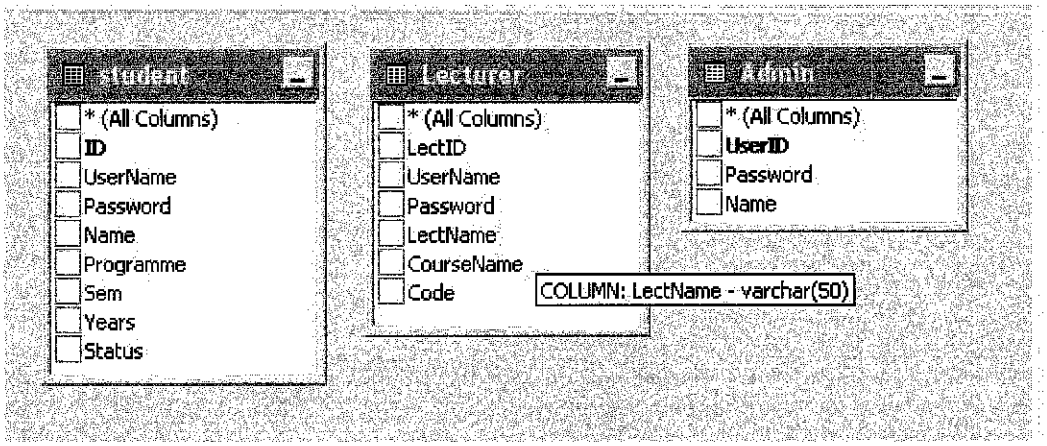
Figure 4.1 Interface design for Online Database Module

In this interface design, it is used to represent how the online database page will be actually designed. Two text boxes are provided to give admin more options in choosing or searching the course subject intended. Admin can search either through course code or course title to find the intended course to be edited or deleted. By providing this, it will give admin more options and to give them more pleasure feeling when using the system. Button 'Search' is the button for admin to click to begin the search process and the result will be displayed inside the data grid. Inside the data grid, admin can edit, delete or add new record just by clicking on the respective button provided on each row. By this, confusion can be avoided and it will ease the user to directly perform their task.

Database Design

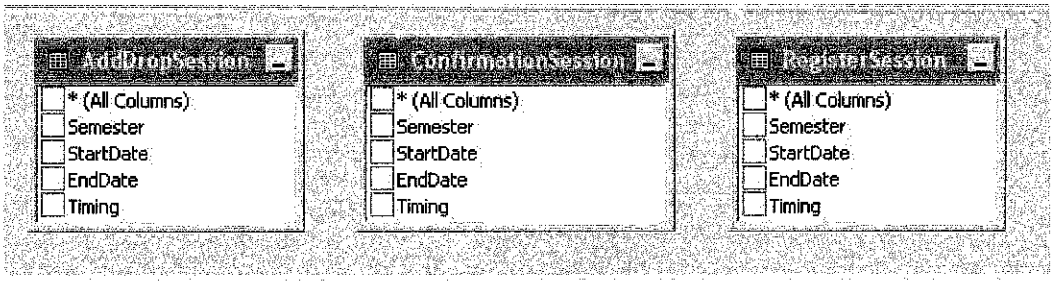
It is important to have a database design because database is considered as one of the most crucial components of a system to store all the important data or information of the system. In order to maintain the data accuracy and its integrity, a database must be well designed and then developed. It is realized that the importance of the database design and specification in any system development, below is the illustration figures of a database design document which is created in order to support system functionalities. For database design, there are eight (9) tables were created in order to store, manipulate and retrieve important data or information regarding the system. Three tables are related to users, three tables for sessions created by admin for the system accessibility, and another remaining three tables related to courses information. More detail description is provided as below by using diagrams:

Tables for Users:



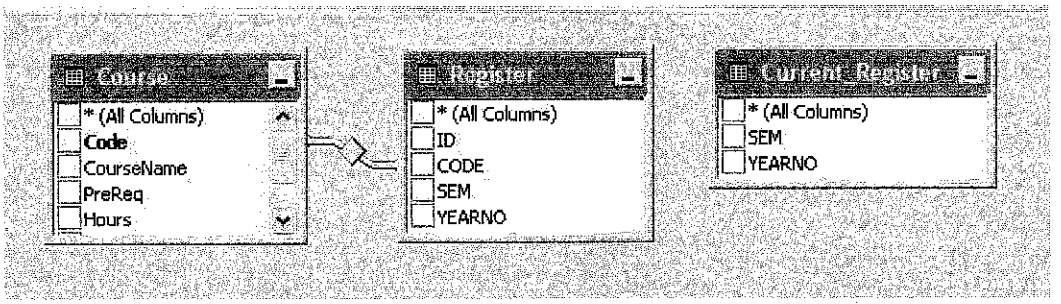
Users' tables are used to store different user types' personal information either for login profiles or transaction information. Each one of them is independent table and not related to each other. As from the diagram, we can see that the primary key is the ID used on each first column created. By this, each user will have different and unique ID type and this will enable them to log into the system to gain access on the modules available or granted for that particular user type.

Tables for Sessions:



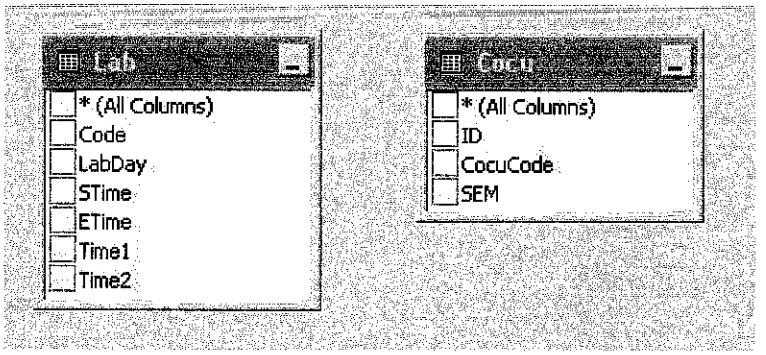
Tables for sessions are created in order to differentiate between 3 main modules for student processes which are the registration session, add/drop session and also the course confirmation session time period accessibility. Each session is very important in deciding the accessibility level and time period of 'Student' user type for each process that he/she wants to perform. Course registration session is the most earliest session that will be created, then followed by add/drop and lastly will be the course confirmation session (according to the academic process flow).

Tables for Courses:



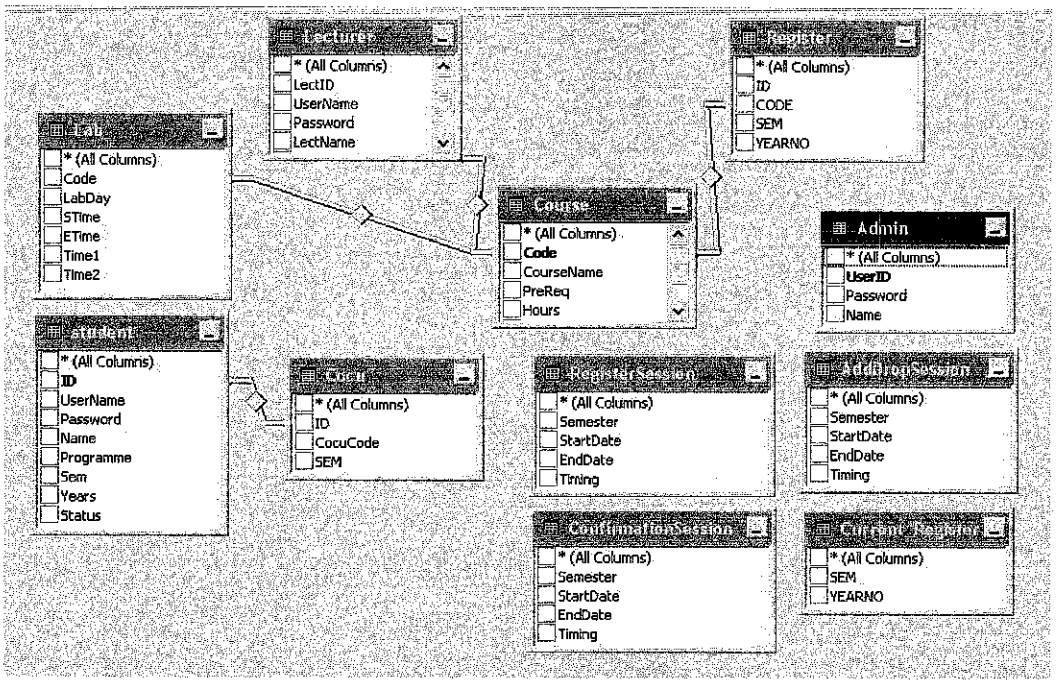
These tables are the most important and crucial tables within ACMS system whereby they will store the information regarding every course personal information, registration transaction information for each student and also current registration session (the semester either January or July and the year).

Tables for Co-Curriculum and Lab Registration



As for 'Lab' table, it stores the information regarding lab session for each subject (if available) such as the course code, the lab day, start and end time. While for 'Cocu' table, it stores the information regarding co-curriculum class registered by students where this information will be used in registration and add/drop modules in order to limit the maximum allowed credit hours to be registered (credit hours counter). If any co-curriculum record is detected within this table for the most current session ('Current_Register' table), the credit hour counter will automatically decrease the maximum credit hours which is one (1) credit hour.

Relationship between all tables:



Those figures are the database design document in which it represents the tables' relationships in the database. The database diagram is created based on the tables that are created inn the Microsoft SQL Server 2000 named as 'acms' database. Besides that, the database diagrams also shows the attributes that are defined in each table such as the columns, their number and names. Some related tables are linked by the using the foreign keys which are the attributes that are same in both tables. With this database diagram created, it will not just guide database development but also the system by giving a clear view on how the data are related with one and another

Interface Design

Each module is designed in a way that will promote standard design towards from the beginning until the end of the system usage. For student module, it will have similar color and design layout; more towards orange and yellow colors combination. As for lecturer module, the possible theme color might be blue (not decided yet), while for Administrator module, the current design makes use of orange color. Those colors are subjected to be changed depending on the suitability of the modules. As decided before, there are 3 types of users who are the **Student, Lecturer and Administrator**, in which creating 3 main modules for each user having only 1 module.

PROBLEMS AND CONSTRAINTS

In any project execution or development, there are for sure some problems and constraints will be faced, and the same goes to this project as well. As for me, the programming skill is one of the problems that limit my ability to finish this project earlier than scheduled. Certain functions need extra work, creative thinking and advance algorithm in order to create and make them to be real work in ASP.NET platform by using server side scripting. Some of the feature like Artificial Intelligence that is tried to be included within this project improvement somehow needs additional thinking in a way to make it really works.

Regarding the tools and software used, there is a need to further explore the possible abilities of VB.NET features in performing faster and much simpler programming works rather than hardcore works. Some of the auto generated objects features were found out during programming tasks were done, making things easier to be completed. This is not a fast thing that could be rush or obtained easily in short time period since it is a new scripting that is explored by me on my own with limited reference internet resources. It is an ongoing process that will be gained during programming work progress and it is really hard when it is not available or we don't know how to use if when it is needed.

Besides that, time limitation also plays a big role in this project development since there is a need to rush and complete this project according to the schedule. Even though this system sounds simple and easy when it comes to the basic functions provided, but however the actual things are really different. There are a lot of minor things that were overseen before this. Those things make this project development schedule consumes more time cost than expected and delay some other tasks as well. For example, the security matter issue. Before this, the security only concerns about the login page and profiles but somehow, the page security also needs to be considered when it comes to smart users using the application system. Since the way system works is different (not all modules or processes are accessible 24 hours to users), Registration, Add/Drop and Confirmation sessions come one after another session ends or expired, the tasks are harder and much complicated.

The last thing is about the meeting with ACS staff who is responsible in handling current system operation. Unable to contact, unavailability in office and lack of cooperation by other ACS staffs also create some problems in completing the process of gathering or collecting potential system and user requirements information. The latest update as be informed to my supervisor is the respective ACS staff is agree to set up a meeting with me on this Friday to further discuss about their expectations, requirements, to sit down and together see how they perform their tasks involving current system, investigating limitations and weaknesses and also to have mutual understanding or agreement on the improvements to be done or included into the new system. Both Student and Lecturer modules can be said almost completed and will be able to be finished on my own without the need of extra outside information since lecturer and student representatives could be selected easily to gather some information. While for Admin module, the hard communication process with the ACS staff really affects the development process and constraint. However, their contribution s still needed since they also play many important parts in the system usability.

SUPPORTING TOOLS

For supporting the project product development and production, it will need a set of supporting tools such software, hardware, application, or equipments that capable of assisting in performing the tasks required easier and able to complete the project within the time frame given, cost and resources available. As for this project design, development and implementation, there are a set of supporting tools that will be used in achieving the project objectives. As general classification, these tools can be divided into two main categories which are software and hardware.

Software

- Microsoft Windows XP Professional Edition
- Microsoft Visual Studio .Net 2003
- Microsoft .Net Framework 1.1
- Microsoft SQL Server 2000 Enterprise Manager
- Microsoft Internet Information Services 7.0

Hardware

- Workstation or web server (for development and as SQL Server)
- Personal computer (PC) for development work

Within this tools discussion section, there are 3 main tool elements which will be further discussed in order to provide more understanding of the reason of it usage into the project development work. The tools are listed as below:

1. SQL Server that supports SQL, database manipulation and web-based programming language
2. Internet Information Service (IIS) as the Web Server
3. ASP or ASP.NET for web based programming

SQL Server

SQL Server will be used as the warehouse storage for all the data and information that are involved in the whole processes of the ACMS in which consisting of student and course subjects information databases. The SQL Server that is going to be used by this system is called Microsoft SQL Server 2000. This SQL Server is the latest version that could be found and freely used so far and are easily downloadable through Microsoft formal website. The selection of the SQL Server is made based on several advantage criteria compared to other type of database platforms like Access or Oracle. The advantages are as:

Security

SQL Server is integrated with Windows NT security and need login information on its server and database in order to connect and get the access to the information stored. By this, the security method of SQL Server is much higher and better rather than other database platforms like Access or Oracle. SQL Server has two authentication modes, and neither is much like Access or Oracles security at all. You can use Windows Authentication, which allows you direct access to domain Users and Groups from within the interface. You can also use Mixed Mode, which allows SQL Server to maintain usernames and passwords (thereby negating the need for a domain or other Windows user/group maintenance).

Scalability

SQL Server support atomic transactions and it guarantee that all changes performed within a transaction boundary are committed or rolled back. While for Access or Oracle, it does not support atomic transactions and doesn't guarantee all changes are committed back. SQL Server also designed for high volume multi-user environments that allow multiple clients to read, write and perform other operations on shared files at the same time.

Larger Database Capacity

SQL Server is suit to build stable and efficient system with many concurrent users and it runs on client-server architecture. It is able to handle and support large amount of data size, at about terabytes of data. In another case, Microsoft Access 2000 falls into the desktop category and works best for individuals and workgroups managing megabytes of data and it use file-server architecture. It does not scale well for large databases or multiple-access, network environments. While for Oracle, it doesn't suit with the environment of usability within UTP or some other organization because of its very expensive price, complexity of management and maintenance, hard to learn and use it and some other limitation on public usage. Even though it has larger capacity storage compared to SQL Server, it is not best suitable used with web applications since the load memory is heavy and need a lot of memory spaces within developer machine or PC in which will make use of mine. If the memory load is heavy, the system browsing speed on its web pages or forms and its performance might be slow and inefficient for what the new system is targeted to which is to increase the speed of data processing and overall system performance.

Automatic Data Recovery

SQL Server 2000 also performs automatic data recovery by checking each database in the system each time it is started. It first checks the master database and then launches threads to recover all of the other databases in the system. For each SQL Server database, the automatic recovery mechanism checks the transaction log. If the transaction log contains any uncommitted transactions, the transactions are rolled back. The recovery mechanism then checks the transaction log for committed transactions that have not yet been written out to the database. If it finds any, it performs those transactions again, rolling forward. While for Access or Oracle, it doesn't have this feature.

Special Features

With SQL Server, it supports Data Transformation Services or called as DTS that is capable of transforming various formats of databases into SQL Server format or from SQL server format into other formats as well. While for Access, it doesn't have that function. Besides that, SQL Server implements stored procedures that act as functions to run SQL command automatically and the properties can be set to run daily, weekly or monthly at any time.

Internet Information Service

Internet Information Services (IIS) is used to makes it easy to publish information on the Internet or intranet. IIS includes a broad range of administrative features for managing Web sites and Web server. With programmatic features like Active Server Pages (ASP) or ASP.NET, we can create and deploy scalable with flexible Web applications. If we are using PHP as the programming language, it would be better and compatible with Apache Web Server to act as the web server since it is open source and freely available on Internet. While as for ASP or ASP.NET, since it is developed or initiated by Microsoft, it needs Microsoft products or applications in order to support the communication between the hardware, software and its application. That is why within this project development, IIS will be used as the web server for the system browsing and to hold the root directory files and web forms.

ASP.NET Programming Language

Because of ACMS will make use of online or web based system application, ASP.NET is the most suitable programming scripting language since it supports web application programming via Microsoft Visual Studio.NET. ASP.NET will be used as the client and server side-scripting for this system development in providing Interactive Web Pages. The reason why we need both client server-side scripting is simply because the system is dealing with dynamic web documents (XHTML, text, XML) in responding to client request from their machine or pc to the server in which

requesting for data or information and services. For our condition, the scenario is students will register subject courses to be taken and the registration input will be stored into database for the next process transactions. Then the database server will store the information and provide service to the registrar and student as well once they need to handle or perform course add & drop. ASP.NET is a compiled .NET programming platform and technology that can be used on a server to create Web applications. It takes advantages of Microsoft's .NET Framework, which provides thousands of classes that deal with XML, text input, validation of user input, and others.

ASP.NET is also a technology for creating dynamic web contents marked up as HTML which includes optimizations for performance, testing and security. It is the latest technology in Web Scripting introduced nowadays that intended to be used in the latest web based applications. It is a growing trend of client server–scripting language and widely used by organization in developing their own intranet system applications. Even though it is tied to Microsoft technology, involving licensing complexity that is not free, it is the latest technology that attractive and challenging.

Discussion

ASP.Net is the latest Microsoft programming framework that allows for the rapid development of powerful web applications. In this issue of Better Web Design, we are going to discuss the advantages of using ASP.Net and we want an ASP.Net programming for the next web development project.

Multiple Language Support

Programmers can actually write their code in more than 25 .Net languages (including VB.Net, C#, and JScript.Net). This allows programmers to develop site in the language they know best and it means that you can more easily find programmers to support the work on your site.

Compiled Code

The first request for an ASP .NET page on the server will compile the ASP .NET code and keep a cached copy in memory. The result of this is greatly increased performance

High Scalability

Much improvement has been done with ASP .NET to provide greater scalability. Server to server communication has been greatly enhanced, making it possible to scale an application over several servers. One example of this is the ability to run XML parsers, XSL transformations and even resource hungry session objects on other servers.

User Accounts and Roles

ASP .NET allows for user accounts and roles, to give each user (with a given role) access to different server code and executables.

ASP .NET Components

ASP .NET components are heavily based on XML. Like the new AD Rotator, that uses XML to store advertisement information and configuration.

3.3 DEVELOPMENT AND IMPLEMENTATION

This phase will be the longest and most crucial phase in the entire Waterfall Model within SDLC architecture. The main activities of this phase are to transform all the design documents that are created in the design phase into a prototype that meets all the objectives of this entire project. Development will be step by step and focuses on modules, which are categorized based on functionality. All the functionalities of the system as a whole are divided into smaller parts of modules, which are much easier to manage and develop. Developer will develop module by modules until is finished as a complete system. The categories are the user functionality and also the system functionality.

In the user functionality, they are subdivided into three (3) entities, which are the students, lecturers and also the admin (ACS staffs). Each one of the entity is concerned on the functions to be enhanced or improved based on the previous system, new reliable and necessary functions to be provided, and also to simplify and ease their navigation structure and flow. These are implemented thru programming tasks using re-engineering concept where those improvements on the previous system are made. Those programming tasks in another point of view are focused on three (3) entities mentioned which are the student entity, lecturer entity and also the admin entity. This is because these are the major entities and modules provided within this system and they are very crucial to be developed since each entity has its on sub modules that are very complicated and very hard to be developed. As the output of this SDLC phase, the results are shown and presented in the Results and Discussion section. All the entities and their respective modules are successfully completed and finished within the time frame targeted.

While developing, the system is also implemented into the web server to make sure the whole system will be able to run at the early stage of development until the end of the development stage. It is to make sure that the developed system will be suitable and able to function well based on the specified software, hardware and network environment.

3.4 TESTING AND DEBUGGING

Testing and debugging were also conducted during the whole project development process, where each developed modules will be tested for bugs and errors. Debugging will follow if there is error exists and this process are important as it is to make sure the modules are developed without minor or major errors and the developer can continue developing other modules. Besides that, this will speed up the development process, improve the client or user's trust on the system and also increase the system reliability. In this last phase itself, major activities would just testing and debugging. It is important to make sure the end product that developed meet the requirements and specifications either user or system requirements. Besides that, this phase is also important to make sure the system developed will be able to run smoothly and without errors or bugs.

The basic fundamental testing methods are carried out such as unit, integration and system testing. Each entity and module will undergo each one of these testing methods and it is very time consuming in order to really ensure the system functioning correctly. Unit testing is done when each sub module or function is developed and constructed to check the function itself can operate and perform the required and expected tasks correctly without any problem or error. This is more familiarized by the developer or author's point of view as independent testing since it will be tested on its own tasks and not involving other sub modules or functions. Integration testing normally within this project task is carried out when a few functions or sub modules are constructed and they need to be integrated together since they are related and operated based on after one another. For example, other sub module(s) will use the result of the first sub module and the relationship is very crucial. As the system testing, it is only carried out combining several modules and all entities to see how well all of them can operate together and their relationship. This is implemented at the end of the project testing phase and the intends are to ensure there is no error when all modules and entities operate together within the project and all data input and output results are correctly processed and displayed.

The testing conducted in this phase will be divided into alpha testing and beta testing. Alpha testing will be the preliminary testing procedure, where it will test the

front-end of the system such as user interface, functionality of the modules, connectivity of the modules and the database with some dummy or fake data. Flaws that are detected are quickly fixed or debugged to prepare the system into the final testing stage. The final stage of the testing, that is the beta testing, will be a comprehensive and well-covered testing which will cover all aspects of the system. In this final stage, all the front-end problems are well solved and real testing is conducted with the real or lives data.

According to waterfall model, at the end of this software process model (SDLC), if there is any program and design error that emerged and which requires the need of new functionality, the system must evolves the remaining useful, by making changes which may repeating some or all the previous phases before this final phase. But in this project scope, evolution process is not covered, but it is possible to return to previous phases to carry out needed tasks if there is a need.

3.5 OPERATIONS AND MAINTENANCE

Within this stage, basically it is done once after the system is fully developed and completed. This is to maintain the system and to ensure that it is monitored, controlled and observed. According to the project plan thru Gantt chart schedule, this stage takes quite a long time, starting from the project completion until the final project presentation. Maintenance involves correcting errors which were not discovered in earlier stages of the life cycle, improving the implementation of system units and enhancing the system's services as new requirements are discovered. In terms of correcting error, it is a continuous task since there is a lot of possibilities can happen when the system is really implemented in live situation. That is why during Testing and Debugging stage, there are a lot of testing is conducted as to decrease the percentage or rate or system possible error in real implementation. If it still happens, then the risk and severe might be able already be reduced and much easier and faster to be solved or overcome thru proper troubleshooting.

Regarding the new requirements discovered, since in our project planning, we have discovered and well define the system and user aspects on functional and non-functional requirements. Normally, when this happens, the identified and obtained requirements will remain the same and maintained since it is really understood and planned and will not be changed. If new requirements still occur, the quantity and the change will not be too drastic and the developer will be able to provide or add it on much faster since the system is already well understood.

Implementation of system unit means the system could be prepared and run on the right operation within the usage time without any problem. The reliability of the system in providing and maintaining the services provided will be the core objectives and to ensure that it is capable of providing the exact operations needed, expected and required by users. If any problem occurs, maintenance and repair process will be conducted to solve the problem and also ensure that users are cared, protected and guaranteed from any error or problem that will harden their task performance.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 RESULTS

In this section, the author would like to share and present the results of this project and will also include further discussion on the results. The structure of this section will be the identification of the results available and evaluation comments on each result obtained.

Security

The first part of this system outcome or result is on the security issue. Regarding system security, the login page has been successfully design, programmed and implemented into the new system. In this login page, it acts as the most front page of every module for each user in order to secure the system contents from being access, interfered or stolen by outsider persons or also can be called as unauthorized parties. This is very crucial in order to protect the data and information secrecy with secured storage from intruders. This login page makes use of user's personal Username and Password given by respective party (in our case study, for students, lecturers and also admin). In this project, it is assumed that the password and username is provided by IT and Media Department where it will centralize and standardize them within campus usability. This project is expected to be integrated with other IT & Media Department's Systems, so that they can control the system all in one time with proper monitoring and maintenance persons.

If the login profiles (username and password) keyed in wrongly, the system will use server side scripting to compare with the actual login profiles for that

particular user (student, lecturer or admin). And if there is difference, the system will not allow the access and will pop up warning message saying that the wrongly entered password and username cannot be found or incorrect. By this, the user will be well informed and provided with proper reminder message. Below is the screenshot of the login page:

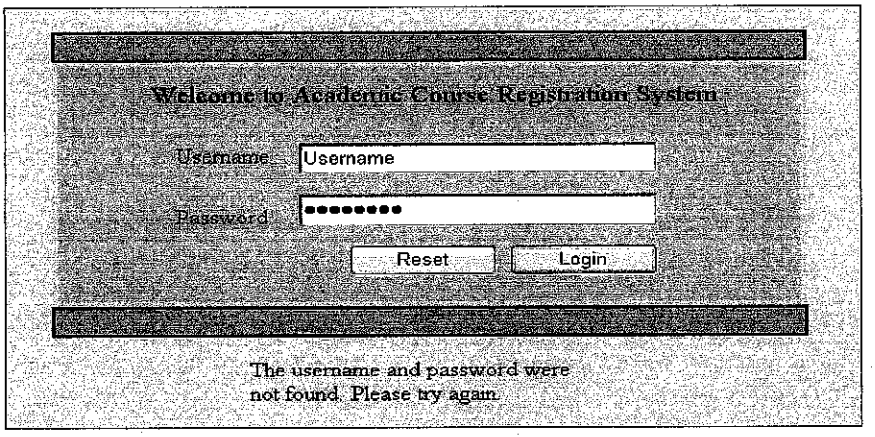


Figure 1 Screenshot of login page for system security

Student Entity

In student entity, there are several modules in which the author would like to discuss about the results from his development and study. The first one is on the Course Registration module where it is used to allow and assist student in performing their course registration process, which is normally happens during at the end of earlier or previous semester. The screenshot of this module is as below:

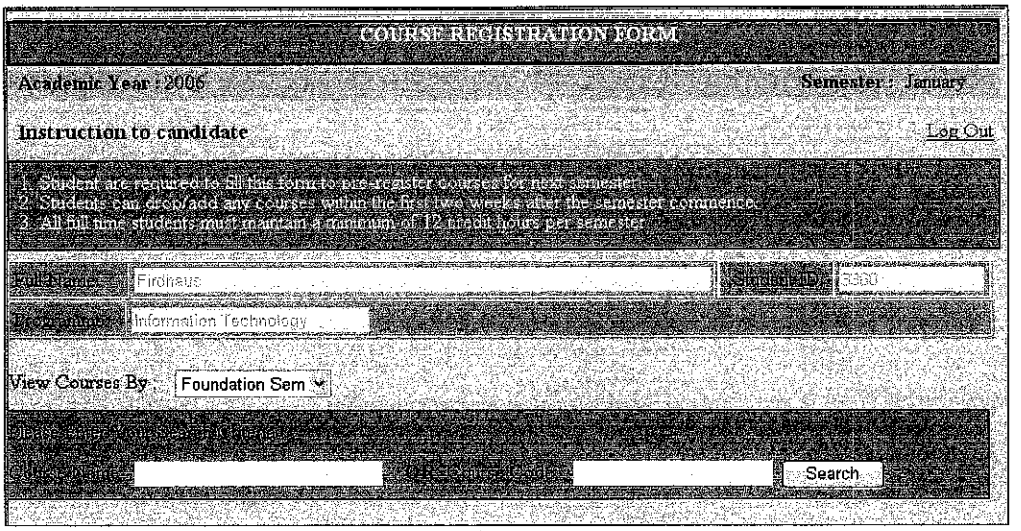


Figure 2 Screenshot of Student's Course Registration Module

In this module, there are some enhancements and improvements done toward it. The first thing is the user no longer needs to enter or key in their personal details before entering into the system as the indication or personal information and ID. This is a traditional method and if done so many times, will become a bit tedious and uncomfortable especially towards students that perform the registration more than one time. Instead of this problem, the solution is by capturing the session of each user profile during successful login process. Each session will be exclusively for one user at one time and no other user can attempt to use the same ID or login profile. The successful login profile will be compared with the centralized database on student information. If the information exist, then the session is created and will used along the process is performed by student. The results are the student name, student ID and programme taken will be listed in the read-only text box. This will be the actual data captured and retrieved from the database so that student only need to key in the login profile for security purpose. Web and database server will process the rest of them. The screenshot is as below:

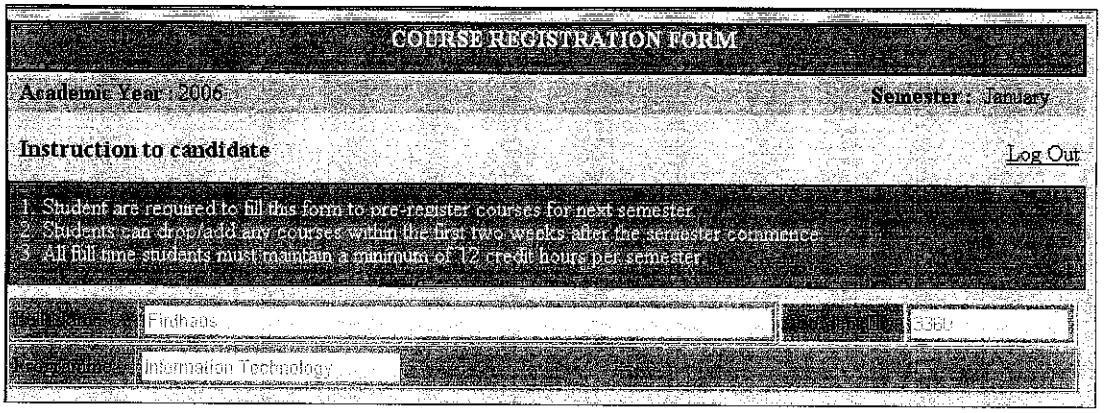


Figure 3 Screenshot of user info display

The second part of enhancements done is on the course or subject selection method. This element part is also be improved by providing more friendly concept, design and navigation structure towards user. Previously, the old system makes use of check boxes to allow students to select their preferred subjects and then clicking a button to register them. This concept is good for a condition where a lot of subjects need to be taken at one time but however, it has its own drawback when each time the submission to be done, the page needs to be refreshed and reload back to allow the process be executed. It will slow down the processing time and makes user feel uncomfortable.

The solution for this problem is to provide a data grid for listing the course subject in which at the same time, each row of subject is provided with a 'Register' button. This is to allow student to click the button and subsequently straight away, register for the course just by adding the course profile into the buffer or tray. By providing this, the page no longer needs to be refreshed each time registration is done and will speed up the processing rate and also improve user's pleasure and comfort when using the system.

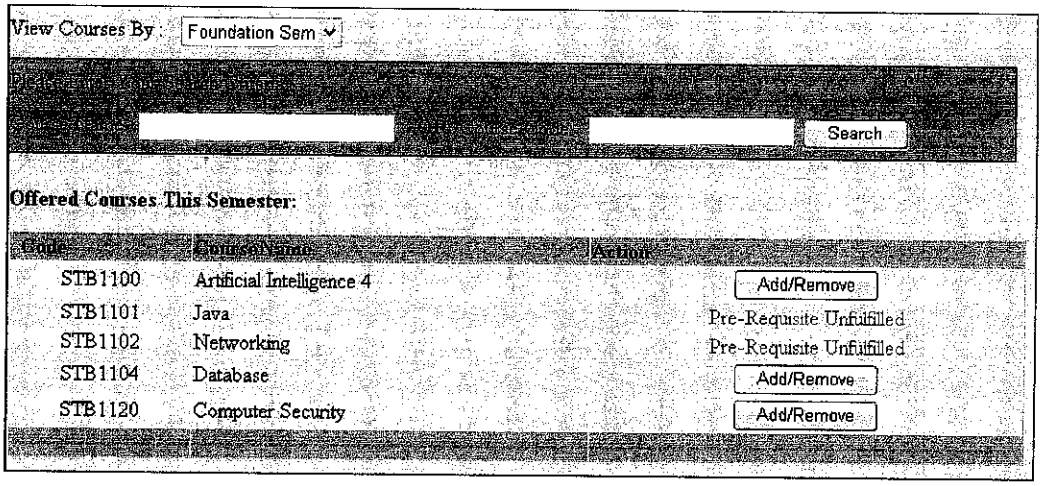


Figure 4 Screenshot of Add Course into tray

The above feature is not only applicable to registration task but also applicable to when the user or student would like to cancel the registration and deselect the course just added. Since the data grid to store those temporary added course for registration is just a buffer, in which developed using session concept, it is easy to just either add more course subjects or to remove them from the data grid list. With a button on each row of course selected, when it is clicked, it will straight away delete or remove the course from the data grid buffer. This simplifies the student process as to remove or cancel the course selected at the first moment without the need to use check boxes and one time click button to perform the task. The process will be faster and much easier to be understood by users without any more confusion.

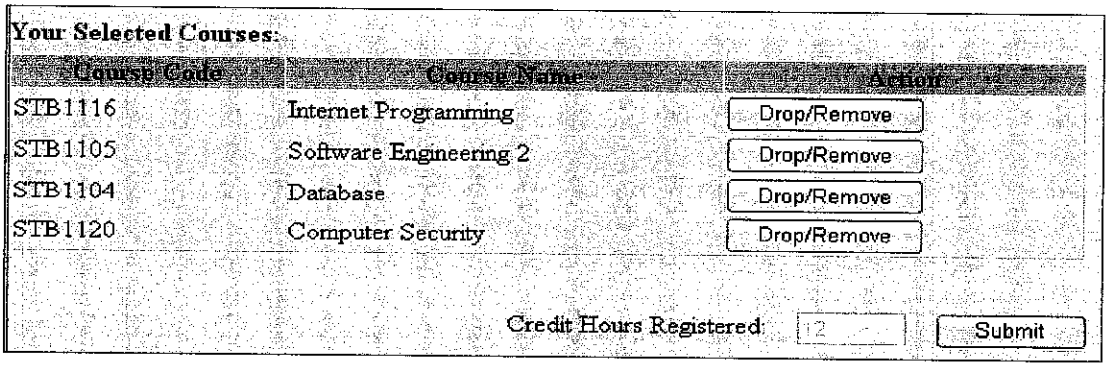


Figure 5 Screenshot of Selected Courses in buffer

Furthermore, if the student had already perform course registration process before this, and they want to redo the registration; let say for adding more or removing course(s), they will be displayed with a data grid containing the previous courses

that they have already selected and registered. By having this, they don't need to re-register the courses again or to remember the course that should be registered since human is sometimes easy to forget something that they have done or performed previously. With this feature, students can perform their re-registration faster by retrieving the previous data entered or submitted and straight away working with it.

ADD DROP

In this sub module, basically the functions provided, interfaces design and navigation process is the same exactly like Course Registration Module. This is because both sub modules make use of the same form template. The major output of this module that the author would like to present is the ability of the system to capture the courses selected and registered by students in the previous process or module, which is the Course Registration Module.

The old traditional way has been improved by providing the exact information from ACS database from Course Registration database. When students are displayed with this exact information, there are several advantages introduced to them such as:

1. They no longer need to remember the courses that they have already registered in previous process. They can simply see the list of courses inside the data grid
2. Direct database manipulation feature, which means whatever they select, add or drop the course, they will directly manipulate with the actual data or information from database and the result will straightly obtained and viewable to the students
3. Students no longer need to wonder or thinking either to redo the same process again or just proceed with the course intended to be added or dropped since the confusion is eliminated by direct information retrieve from actual database from previous process.
4. The process could be simplified by instructing the system to perform the rest of the traditional methods automatically and able to reduce or alleviate

human (ACS staffs) task interventions almost 100 percents. This is because they no longer need to perform manual course pre-requisite checking since this process is already automated using the new system designed and developed.

Lab Registration Module

This is another sub module that resides within Add / Drop Module that is specially designed to improved lab registration process in which currently performed in manual method. Previously students need to go to the respective lecturer's office to see or view the lab sessions available with the relevant information such as the time, venue and numbers of slots available. Then they will write down their names and ID to the respective slot(s) preferred. After that the lecturer will get the list and then transform it into computerized data by manually key in the student names and ID into Excel sheet, which is very tedious work and takes long time to be taken, with additional time wasting for the lecturer.

With this sub module created as further enhancement to the existing system, it will be able provide online lab registration process to students in which provides several benefits to students and lecturer. As for students, they no longer need to go to the respective lecturer's office to see the list but instead can straight away view the available slots and lab sessions opened for registration via online facility like Internet from PC. The tedious process of competing to firstly write their names and ID to book for the slots and also writing in on the paper can be simply eliminated. As for lecturer, the new module will provide them with fully computerized data obtained from online process performed by students in Add / Drop Module. They can save their time and ease their tasks by the system ability to provide complete list of registered students for lab sessions according to the time, slots, venue and day which is prepared automatically when the system processes it though capturing it from the module database and arrange it accordingly.

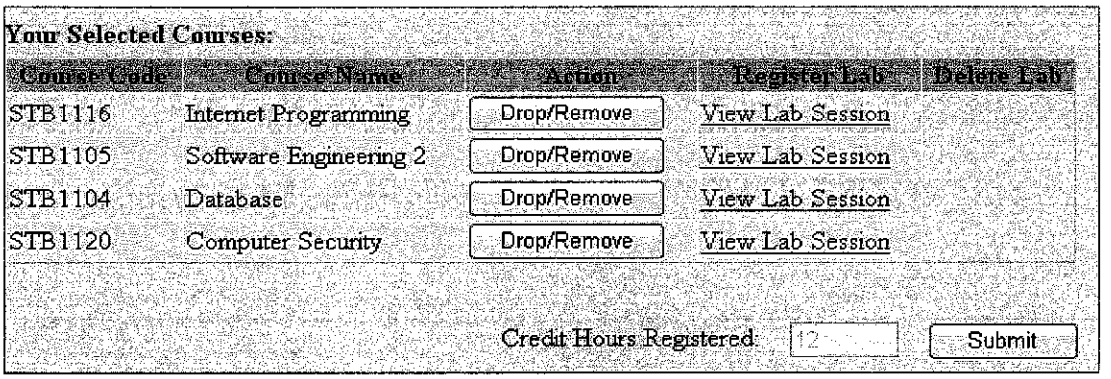


Figure 6 Screenshot of Lab Registration Module

When students accessing Add / Drop Module, in the selected courses data grid which acts as a buffer, there will be a column viewed as the indication of lab registration if the course contains lab sessions as part of the learning method and approach. The column will contains web form hyperlinks to the respective lab registration module page designed by the developer. When user clicks this hyperlink text, displayed as "View Lab Session", it will redirect user to another web page in which it displays the list of available lab sessions or slots for that particular course name selected. Each course will have its own row of course sessions and which column row that the user clicks will respectively trigger the course lab registration information.

If student decided to cancel or change their lab registration slot to another slot, they are also provided with another last column that is only available or viewable if the students already had registered their lab session previously. This column is specially provided to allow student to edit or change their lab slot in order to avoid them re-register the lab session for second time but for another slot. This feature will be able to prevent duplicate data or also known as data redundancy, in which the same student might have two different lab sessions for the same course subject.

Inside the Lab Module Page

Inside this module page, the interface design is very simple since it only uses data grid to display the data and prompt for user action by clicking the button. In this page, there will be only three data grids used. The top data grid will display the slots opened and available for registration to students for that particular course selected. While the middle data grid will displays the full slots that are not available anymore for registration. Each data grid will display the maximum number of lab accommodation supported; let say 40 students, the number of students that already register and also the number of empty or available places. This will provide very informative acknowledgement to students and will become very useful feature in this module.

The bottom data grid is used to display list of students' information that having problems with the lab sessions offered; for example timetable clashing and slots already fully booked. However, the bottom or third data grid is only viewable to the lecturer and not for students. This will be used by lecturer as reference to request their further action such as adding more lab sessions if the current one is not enough or by adding or editing the maximum accommodation numbers supported.

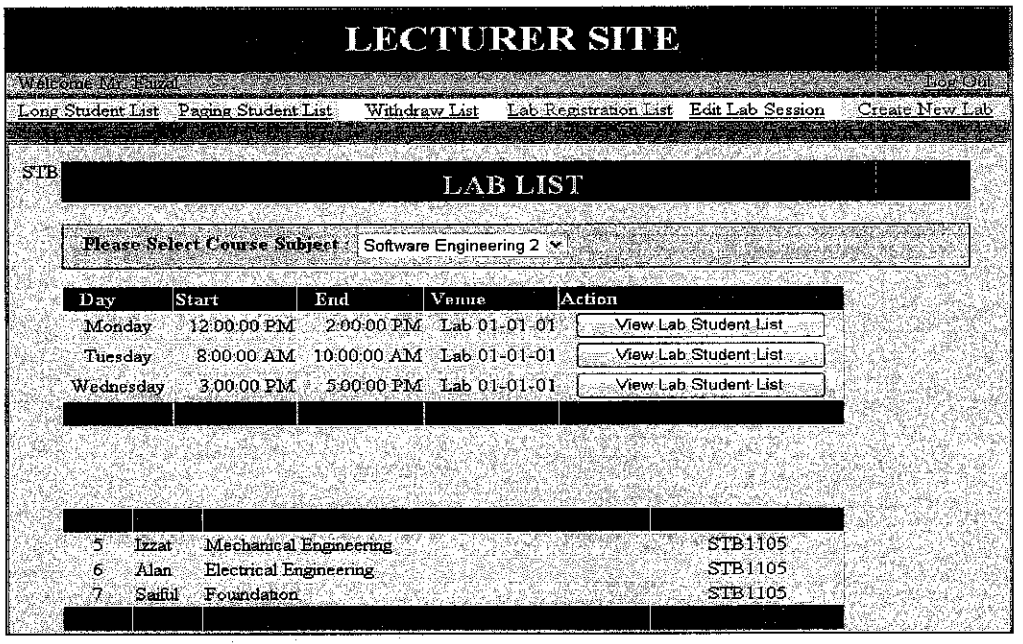


Figure 7 Screenshot of Lab Registration Module for Lecturer

As for student, they will only able to view the top data grid and straight away provided with registration button to allow them to register for the lab session according to the respective time, venue, day or slots.

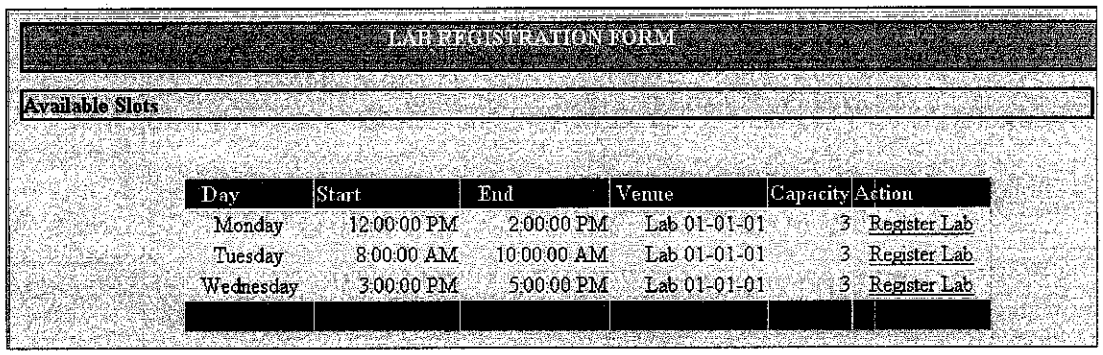


Figure 8 Screenshot of Lab Registration Module for Students

As for Course Confirmation Module, it will list data grid containing information of registered and confirmed courses subjects to be taken for incoming semester. The design, interface and information provided are mostly the same like the old system since it is just be used to display the result and data after the course registration

process is fully completed, which means after the deadline date when it is ready for Course Confirmation Module session to be opened and be accessed by students.

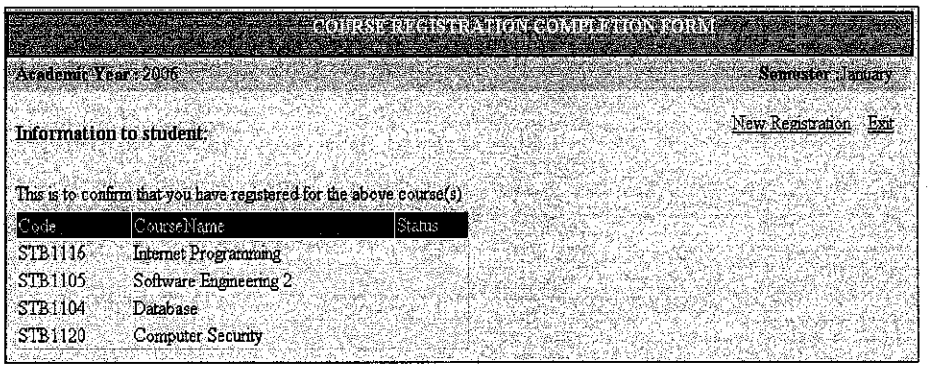


Figure 8 Screenshot of Course Confirmation Module

Usage of Session Technology

As be mentioned in the early of this project research and study, the author would like to prove the potential and advantages of using session technology in web based application development as for security purposes and system protection. Session is used in the whole project development in order to keep each user's transparent profile to be used throughout the system navigation process as for protection and to prevent unauthorized or unknown intruders to hack into the system using viewable parameter inputs that normally can be translated or retrieved from URL address bar in web browser. As the result of this project, the parameter sent to the system for processing located within URL address bar will not be visible and hided from users view.

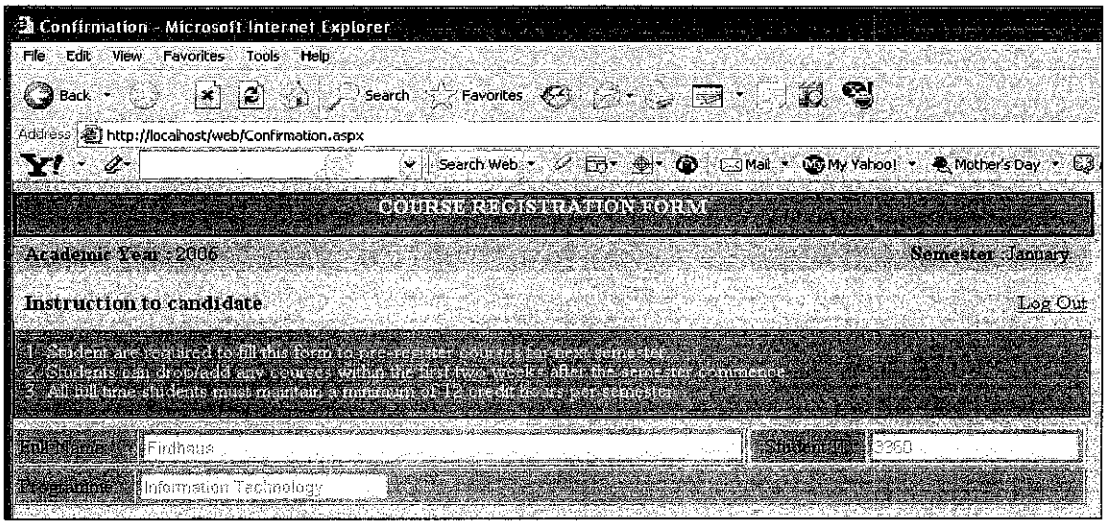


Figure 8 Screenshot of URL address bar with Session technology

ADMIN MODULE

Create Session Module

This module is designed by the developer to allow the administrator to control the system timing by setting the start date and the end date of the system. This is to limit the time frame for users (students) who will use the system according to the time allowed; let say certain period of time to perform certain process. There are 3 time sessions or periods that the admin could set for students in controlling them while using the system. The periods are Course Registration, Add / Drop and lastly Course Confirmation. In the system, the admin only could set the start and end date of the process required and within the time frame, students will perform the task required according to the time frame specified. If they exceeding the time frame set, they no longer can perform it and will need to meet the admin for further action.

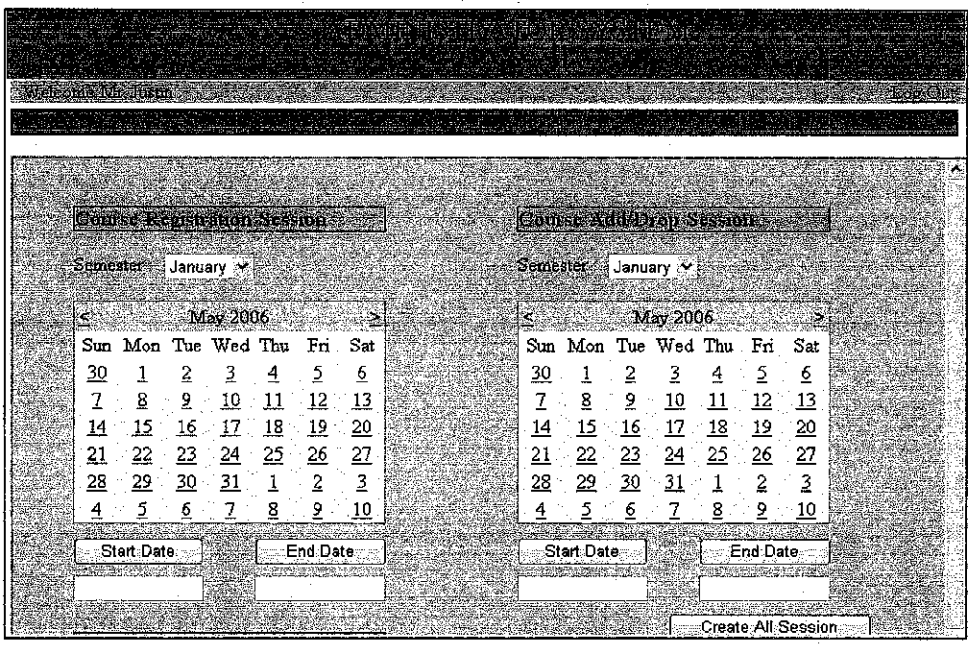


Figure 9 Screenshot of Process Session Creation Module

Online Course Database

In this module, it allows admin to perform their tasks normally done in office to be performed outside the office. This is because, normally ACS staffs manipulate the database and controlling the database within the office and they cannot perform it if being outside the office. This is due to unavailable online database to them in which limits their job performance. As the solution of this problem, the developer / author has created this new module to help ACS staffs and provide them more capability in performing their task, even though not within their work area.

This online database could be used to add new course information, delete current course not needed or already decided to be removed, edit the course information such as the name, credit hours, pre-requisite course subjects and other attributes.

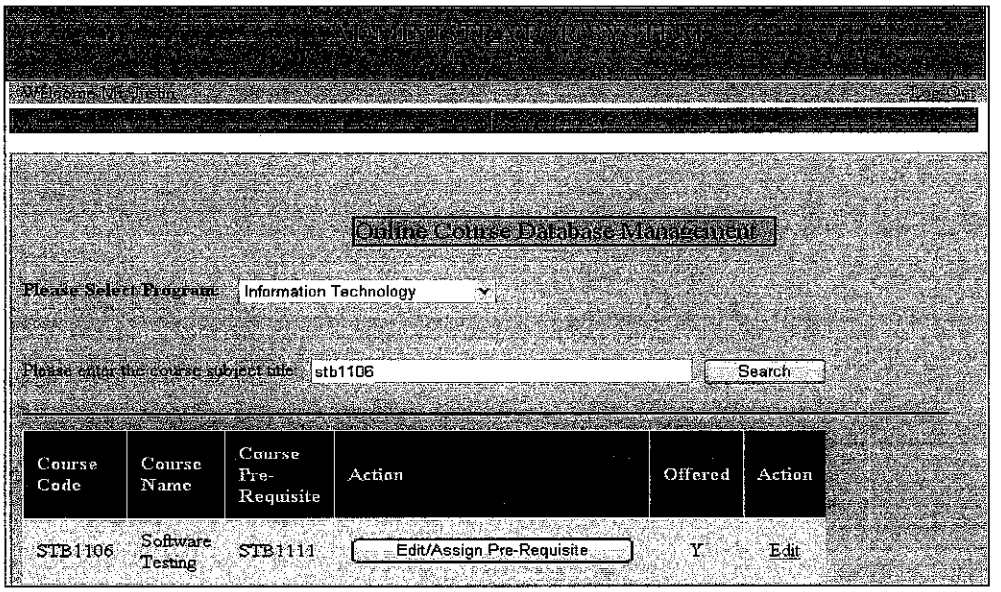


Figure 10 Screenshot of Online Database Module

Student Monitoring System

This is an additional module provided to ACS staffs / admin to assist them entertaining problematic students who having problem in either their course registration, add / drop or confirmation. It is as the assistance module to help admin to keep track on student process by allowing admin to perform the exact process but with their intervention and monitoring. This is to secure the system and to provide more protection from cheating. With this system, if a student having problem to perform the required process due to certain acceptable reason, their problems will be solved by admin thru performing the same tasks but all the data key in or input for the process will be done by admin.

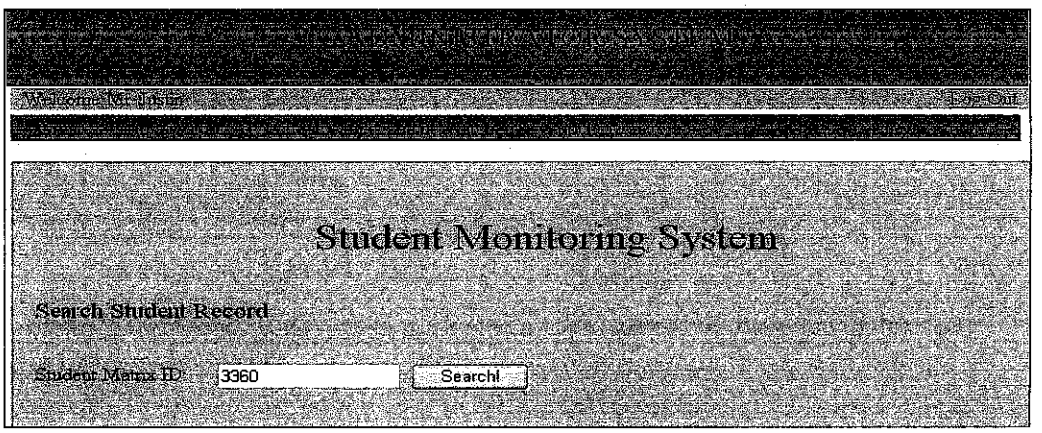


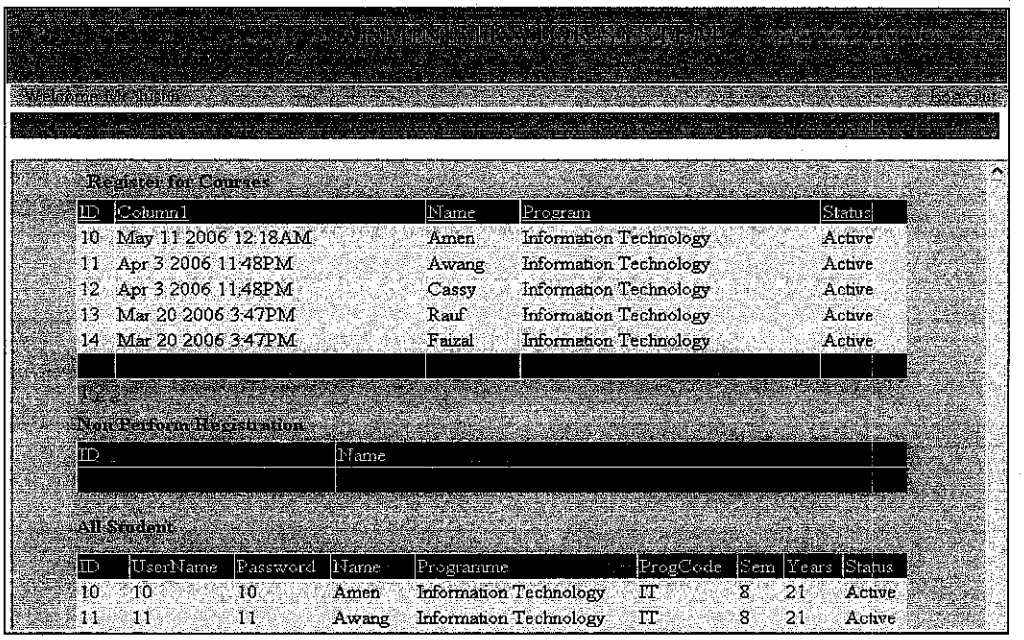
Figure 11 Screenshot of Student Monitoring System Module

All Registered Students

This module will simply just display the list of students in the form or data grid as the data representation. There are three (3) data grid used which are used to:

1. Data Grid 1 - To list all student names and ID who are eligible for course registration
2. Data Grid 2 - To list student names and IDs who are already performed course registration process
3. Data Grid 3 - To list student names and IDs those have not performed course registration process yet

The ACS staffs require this module during meeting with them in specifying the users and system requirements. The developer decided to develop it and providing them as new enhancement to the existing system used by UTP. According to the developer, this module will be able to keep track and alert admin to know the number of students who has performed course registration, who have not yet by comparing to the whole complete eligible student list. By this, they could have updated information, assisting them to monitor the whole process, ensuring the process performed by students and able to improve the admin effectiveness and efficiency in performing their tasks.



Registered for Courses

ID	Column1	Name	Program	Status
10	May 11 2006 12:18AM	Amen	Information Technology	Active
11	Apr 3 2006 11:48PM	Awang	Information Technology	Active
12	Apr 3 2006 11:48PM	Cassy	Information Technology	Active
13	Mar 20 2006 3:47PM	Rauf	Information Technology	Active
14	Mar 20 2006 3:47PM	Faizal	Information Technology	Active

Not Perform Registration

ID	Name

All Student

ID	UserName	Password	Name	Programme	ProgCode	Sem	Years	Status
10	10	10	Amen	Information Technology	IT	8	21	Active
11	11	11	Awang	Information Technology	IT	8	21	Active

Figure 12 Screenshot of Student List Module

LECTURER

In the lecturer entity modules, mostly their modules operate based on database retrieving and information displaying rather than data input. Their modules will help the lecturers in getting the needed information for them to keep updated and no need to wait for long time just to get the completed list from ACS. They now could get the information needed anytime they want and furthermore, they can download and save the record into their PC or laptops. With this, the lecturers could make faster decision and estimate the allocation of learning and teaching resources much earlier as the preparation could be made in advance.

Student List

To lecturer, they are provided with a module that will give them the list of student names, IDs and other related information that registered for the course that the respective lecturer is teaching or going to teach on the next incoming semester.

Basically, each lecturer will teach at least one course subject and if students register this subject, his or her names and other information will be retrieved and displayed to the lecturer. During the registration process, when students submit their form, their names and IDs are inserted and save into the database pertaining the course subjects that they have registered. This same information will then be retrieved or arranged according to the lecturer's subject. When the lecturer wants to see the current list of registered student for their teaching course, they will get the list of names together with the calculated numbers of students. This is very important as new improvement since current system doesn't provide this feature and it is hard for the lecturer to plan for their teaching materials and class allocation since the estimated number of students cannot be obtained earlier and only at very last minute. With this improvement, they can get concurrent and latest update of registered student number in which allows them to prepare their teaching material earlier, allows them to estimate number of lab sessions should be opened or offered for students according to the number of students and also looking for the right size of lecturer class to accommodate appropriate number of students.

There are two (2) types of displays provided to lecturer. One is the long list in which list the whole list of registered students within one list. This is not so appropriate since if it contains a lot of students, the lecturer needs to scroll down the list since it is very lengthy and causing no pleasure usability to users.

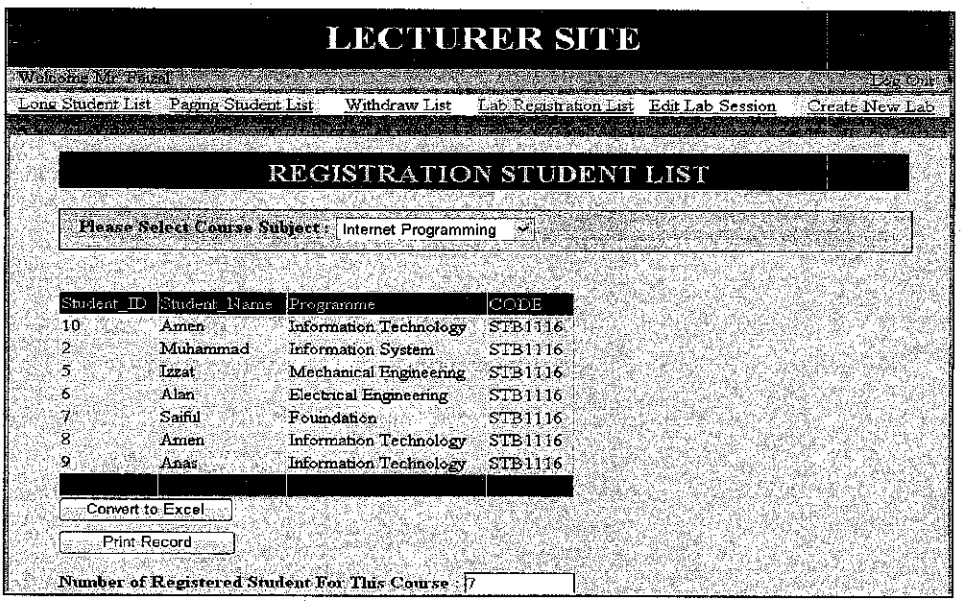


Figure 13 Screenshot of Long Student List Module

Another list is in the form of paging like always see in "Google" search results if it contains more than certain number of results. Even though the paging size is quite limited, meaning that we have to open many paging number, but however this feature is much better in providing user friendliness since user no need to scroll down for too long and the information display is more effective and appropriate.

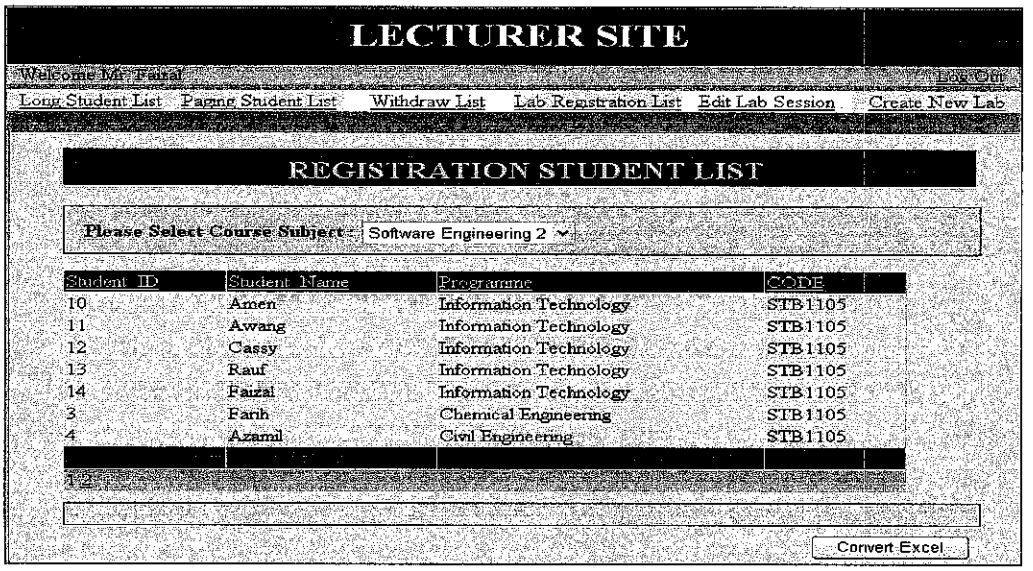


Figure 14 Screenshot of Paging Student List Module

Withdraw Student List

Withdraw student list module is developed just to provide lecturer with the list of students (if any) who has withdrawn from taking the course. There are many reasons for a student to withdraw from a course subject but the concern of the system is to provide the exact information and who is the person. By having this feature, if in the class attendance, there are several absentees done by students, the lecturer can keep track of the student(s) whether either that student(s) is withdrawn from the course or still actively taking the course. If withdrawn, there no problem the lecturer needs to concern but if the student is still active, the lecturer needs to send reminder letter and keep track of the students. This module is responsible to help lecturer to keep track of this students by retrieving and comparing the database information in ACS in which performed automatically by the system itself.

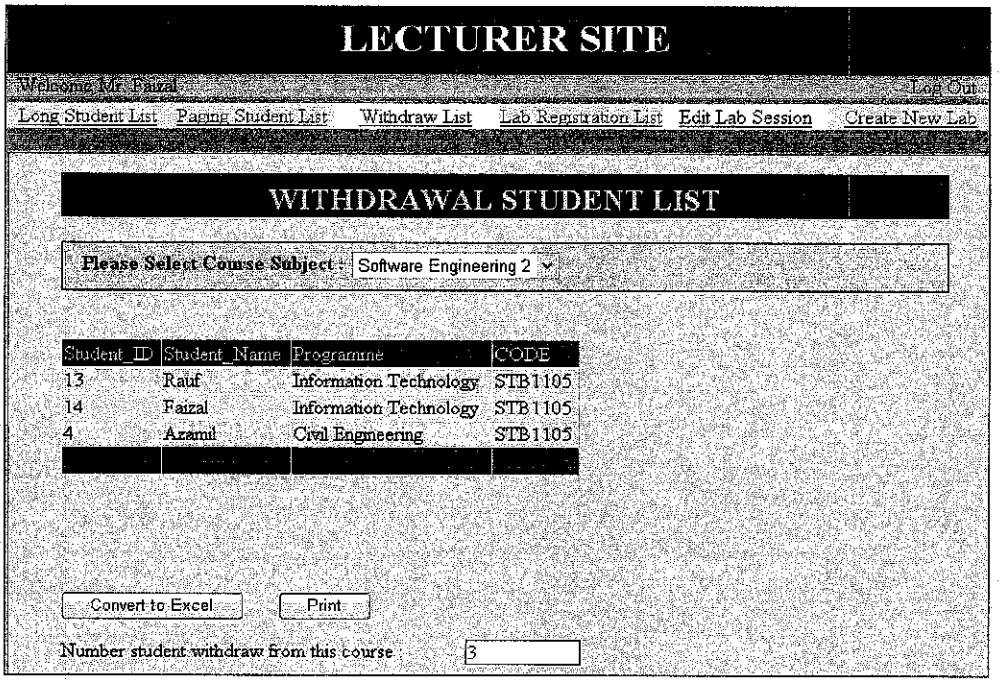


Figure 15 Screenshot of Withdraw Student List Module

Lab Registration List

This module will list and display the students' information those who registering for the lab sessions opened or offered by the respective lecturer. When students register for the lab session, their names and IDs will be submitted to the database and this same information will be retrieved back by the system to be displayed to the lecturer. This is to allow the lecturer to get the number of registered students for the lab session and their information as for references. The lecturer can select the course that they intended to view (if the lecturer teaches more than one course subject) and the list will be viewed according to the course subject code and name.

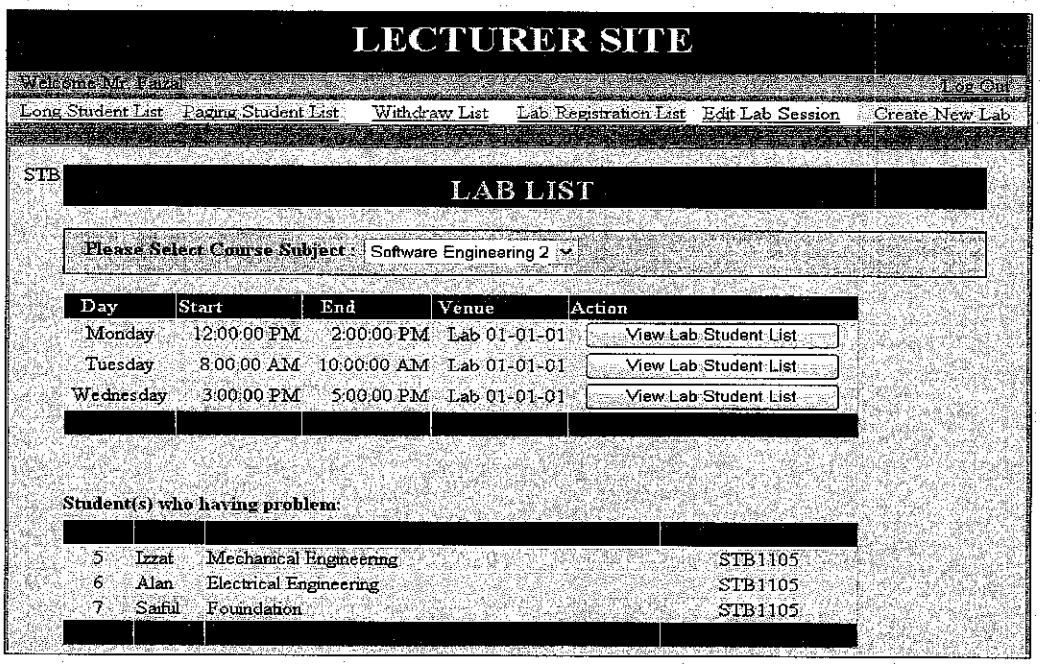


Figure 16 Screenshot of Lab Registration Student List Module

Other Modules

As other supporting modules, lecturer will be able to edit or modify lab information record if they need to do it without the intervention or without the need to wait for ACS. This is because to avoid too long time waiting and to allow the process of

editing the lab information to be done in advance and very fast just in time when it is needed or necessary. They are free to edit or modify the lab records, for example time, venue, day and number of accommodation supported.

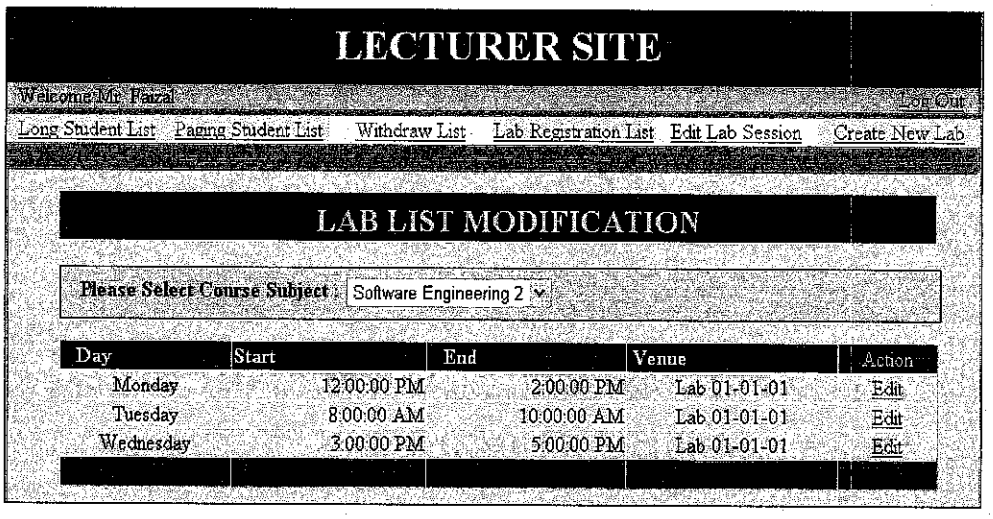


Figure 17 Screenshot of Lab Session Modifying Module

Furthermore, they also can create new lab session or slot by themselves without the need to wait for ACS to perform it. In this case, the lecturer is given the authority to create new lab session whenever they think it is suitable due to some considerable constraints and the new created lab session will be notified to ACS and saved into the database for timetabling purposes and venue reservation.

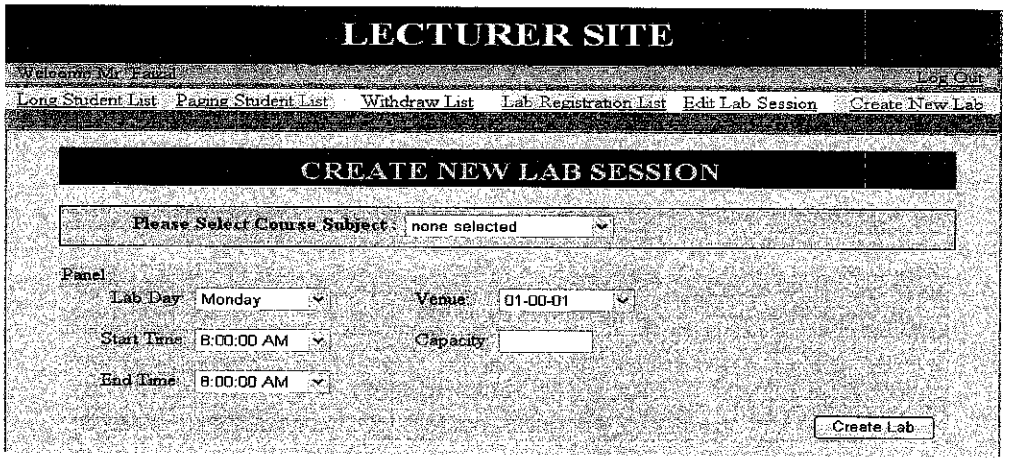


Figure 18 Screenshot of New Lab Session Creation List Module

Sometimes, lecturer has a problem of obtaining the list of student information for them to prepare teaching materials, considered lab sessions to be offered and choosing the suitable lecture class. This problem is already solved by the developer / author thru several results discussed above.

Download Function

When it is take into consideration, this list is much better if could be possibly be downloaded by the lecturer. This is because normally student list name always obtained by the lecturer during first week of the semester and during the third week, that is after add /drop session is finish. This will create difficult situation to lecturer as it is very late and harden the lecturer to make earlier preparations. The solution for this problem is to provide additional download function to every lecturer module (applicable to the module that contains data grid and student list information). By having this, the lecturer can download the data grid information into their PC or laptop and they can keep it for reference. Firstly, this function will automatically convert the data grid into Excel format sheet and then this list will be able to be downloaded by lecturer since most PC nowadays operate based on Microsoft OS and the Excel format is the most suitable format to store information in a form of sheet.

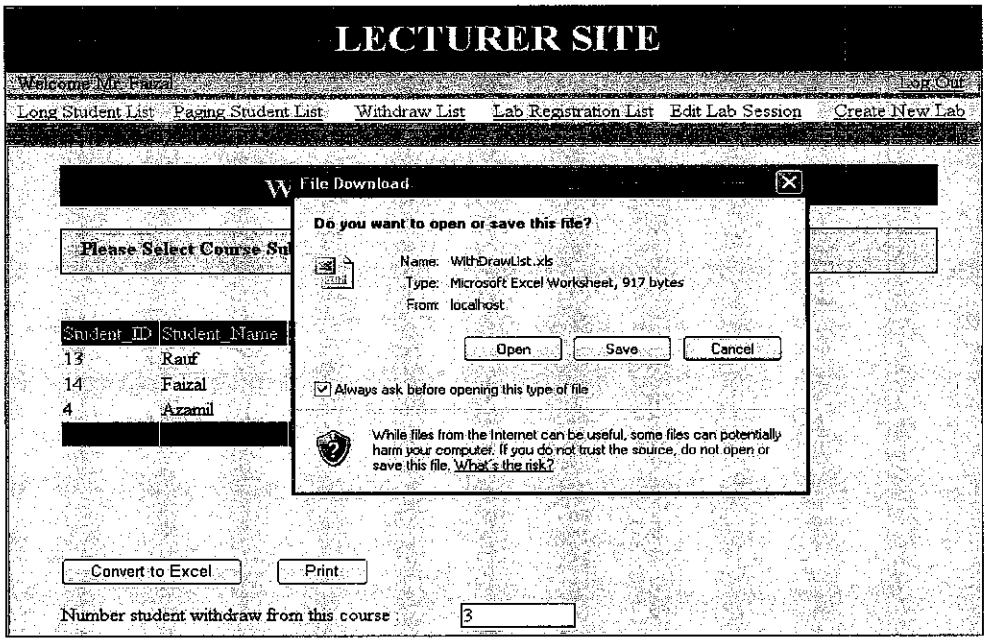


Figure 19 Screenshot of Excel Conversion Function

Print Function

Print function is provided as an option to lecturer if they don't want to download or save the record into their PC or laptop. This function is provided with the capability to allow lecturer to print the data grid containing the information they want and allow them to have the hard copy of it. This function only works within Local Area Network (LAN) only since the function only automatically discovers and detects local printers that exist within the network environment. Currently, this is the only available technology within ASP.NET and hopefully, in future it could be improved by having more wider printer discovery and detection; perhaps maybe thru Internet.

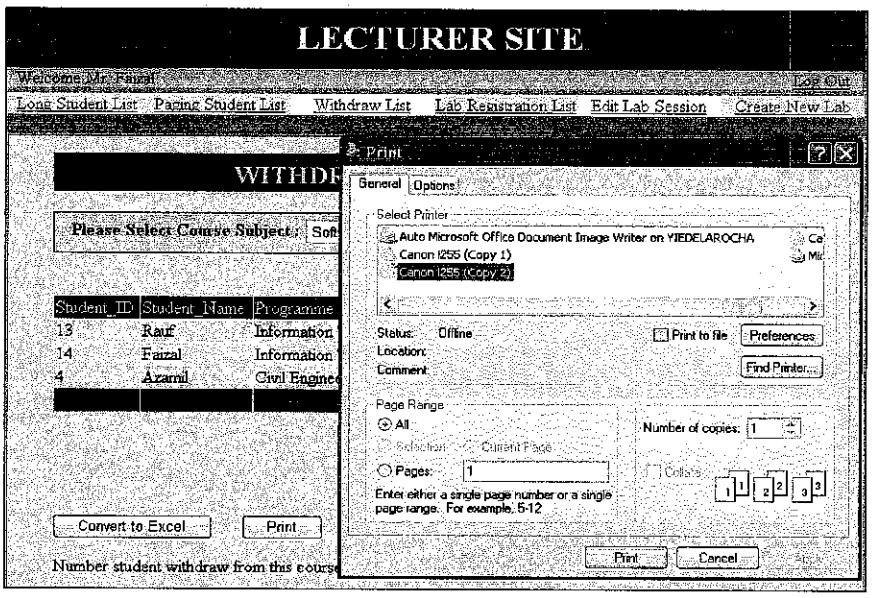


Figure 20 Screenshot of Print Function Simulation

Check Pre-requisite

One of the crucial elements of solution providing with this new enhanced system is the capability of system to be fully automated in comparing and checking whether the pre-requisite subject for a certain course subject to be taken is already fulfilled or not. In previous system, ACS staffs perform this task manually and according to them, this is a very tedious work and very time consuming since the process needs a very detail concentration by them to manually check each subject one by one. Somehow this prompts and creates the potential of human error and some cases might escape, unseen or undetected; if not now maybe in future.

With the new system, it checks the pre-requisite of each subject to be registered by the respective student and if they are already fulfilled, the selection and registration is allowed. Otherwise, if the database does not contain previous pre-requisite fulfillment, then the registration is ignored and warning text will be displayed to inform the student inside the data grid just before they click the course subject. The principle applied here is to provide only valuable and necessary information to user. The information that the user cannot click will be displayed with proper text

message and the button is replaced with text message instead of button that unable to be click. The warning message is as follow:

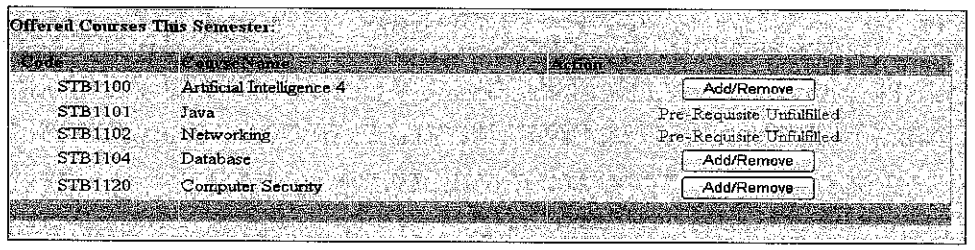


Figure 21 Screenshot of Pre-requisite Warning Text Message Display

In the below section, the author quotes the sample coding or syntax that is programmed in order to create this function and to perform the automated checking. The function relied on this SQL syntax manipulation algorithm and it is constructed by the developer / author himself. The algorithm syntax used is as below:

```
DBConn5 = New SqlConnection
("server=MARTPEA;user id=FYP;password=FYP;initial catalog=acms;
Min Pool Size=5;Max Pool Size=60;Connect Timeout=2;")

If Session("ProgCode") = "IT" Or Session("ProgCode") = "IS" Then

strSearch5 =

"SELECT * FROM Course WHERE Years ='" & Session("Years")& "'
AND Offered ='Y' AND CODE = '" & dgCourse.Items(z).Cells(0).Text & "'
AND PreReq IS NOT NULL"

If dtrSearch5.HasRows = True Then

  Session("PreReqValue") = dtrSearch5("Code")

If Session("ProgCode") = "IT" Or Session("ProgCode") = "IS" Then
strSearch6 =

"SELECT * FROM Register WHERE ID = '" & Session("UserID") & "' AND
SEM < " & Session("Sem") & " And CODE = (SELECT PreReq FROM Course
WHERE Code = '" & Session("PreReqValue") & "')"

Dim strMessage As String = "You can't register this course subject because you have
not fulfill its pre-requisite."

Dim strScript As String = "<script language=JavaScript>"
    strScript += "alert(""" & strMessage & """);"
    strScript += "</script>"

If (Not Page.IsStartupScriptRegistered("clientScript")) Then
    Page.RegisterStartupScript("clientScript", strScript)
End If
```

Figure 21 Screenshot of Pre-requisite Checking Function Algorithm

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

In this new competitive area of rapid development and potential growths of technology especially in web based applications, solutions that are able to provide speed, assistance, time and cost reduction, and integration with their operations, are highly essentials not only to businesses but also to education area and sector. At the end of this project, a prototype and a dissertation is produced as the solution for the problem statements identified for current usability and system improvement on Academic Course Management System in higher educational institutions like colleges or universities.

In the author's point of view, the project is worth to be developed and implemented even though it involves system re-engineering concept which is much harder rather than developing new application or system. From his literature review or study, the web based application or system technology is getting more implemented and become more important in many areas of applications such as education, business solutions, industries and others. Furthermore, web based applications are getting widely used and the demand on it is higher and keep increasing in terms of its usability in any possible area to assist human in making decision and obtaining fast results; with flexibility in performance and usability. The author also has discovered some other web based applications that is almost identical to the one the author is developing but however, the restriction into the system with secured policies and procedures like login page makes him quite hard to predict the sample design and functions. But however, it put positive impacts to the project to be developed that is the security is the most front cover or process that should be capable of protecting the

secrecy or confidentiality of the page or system contents towards outsiders and unauthorized users.

At the end of this project, the author would like to conclude that the system that is developed able to meet the objectives that are defined at the early phase of this project. The objectives are set and well defined as the indication of the benchmarks and target solutions for the problem statements faced by any intended users like staffs, students, lecturers and other parties. The system prototype can provide an automated, systematic and centralized system which allow better course management process and data processing transactions within campus in which to provide better performance, faster data processing speed and processes, more useful functionalities than existing ones and overcome problems faced by users (students) in improving the user friendliness concept and usability rates. This prototype system is also proved able to simplify course management processes by academic staffs, data updating and student monitoring feature by lecturers and also ability to smoothly registering for courses intended, perform add / drop if needed and finally obtain the confirmation slips within faster time and zero problem for students.

With a web based application, lecturer and academic staffs able to perform their task whenever there are at any time with secured login profiles and identification. As for lecturer, they can access directly to the university web server and database to get the latest and most updates information that they required or supposed to be informed; for example number of registered students, lab registration index and other information pertaining their subjects.

As one of the most crucial objectives, this Academic Course Management System via web based application is able to solve, eliminate and eradicate traditional manual transaction processes performed by staffs of Academic Center Service (ACS) in calculating and identifying the correctness and eligibility of the students pertaining completed pre-requisite subjects previously in order to allow them to register for the intended subject(s).

The author also realized that the developed system will help to save cost in terms of time in which will be able to reduce the time taken to manually check for eligibility

and completed pre-requisite subjects that normally takes a long time. It is a very tedious process and prompts another problem, which lead to human error possibilities. Furthermore, students' complaint could be reduced a lot by having better performance system that not only assist them in performing intended tasks but also informing them supposedly information with fast result and updated data from central database.

5.2 RECOMMENDATIONS

In this section, the author will discuss on some of the recommendations that can be implemented to the system which the author has developed. All these recommendations are gathered by the author throughout his development of the project and also some by lecturers and colleagues that also tried out the system. All of these recommendations are very important as they are the improvements that can be applied to have a better system in future.

Create More Functions and Modules

The first recommendation is to create more modules that can handle different types of users and processes using this system. Currently, the prototype developed is to handle several main functions for 3 different types of users which are Student, Lecturer and Admin. As mentioned by the author, there are other types of processes that can apply this system to simply the process and create more efficient results. For examples, modules in managing student attendance, checklist for students before graduation and other academic processes. The extra modules mentioned can be developed to suit with each type of transaction or process but however, the author has to be careful, as the system will become too complex and the scope will be much wider.

Integration with E-Learning System

Second recommendation is the integration of this system with E-Learning System in campus whereby it will be ease student process. Currently, students have to manually enrolled into each course registered and confirmed during registration and add/drop period. This is to 'register' for the course again and get the updates, information and access to documents (notes, assignments and news or announcements) related to the course from its respective lecturer. If this process could be automated, it will ease student since they do not need to re-register again or enroll into those courses. Perhaps the E-Learning system could just automatically enroll the courses or subjects that have just been registered by students after registration period at the beginning of

the semester. This implementation will make use of the registration database tables or records and the database server will automatically update and insert the information for ACMS into E-Learning System database.

Provide Fully Automated Database Administration

Third implementation is to provide fully automated databases administration where a function could be added just to transfer or move previous semester data or information into reserved database records for references. This is mainly for admin modules where every semester they have to maintain the system and pull all the data before the new sessions could be used with new input data and results. It is believed that this process is still in traditional manual process, for each semester it is done. If this function could be provided, the system will do the data transfer process by itself and the admin no need to worry anymore about transferring the previous data and information into new tables of record before starting new semester. This solution could be achieved by using Microsoft SQL Server feature where the SQL Server provides data transferring schedule and data import / export from or to other tables with predetermined settings by users. By this, admin can set the time or when to transfer those data; perhaps maybe after the examination and the system will do the rest of processes automatically efficiently and effectively with timely manner.

More Complex and Strong Security Policy and Methods

Since this system deals with a lot of transactions, it is very important that the system is secure to be used. Not only secure, but safely and more secured than what it having now. All courses and other related information (students, lecturers, staffs and other related matters) must be protected from being stolen, accessed or intercepted by unauthorized parties. Not to forget the main system, where its security must also be enhanced, updated and improved with most current technology or updates to make sure it's reliable and able to withstand cyber attacks. It is recommended to install any security feature and always update available patches and virus definition to protect the server.

Emerging to Mobile Devices Technology

Nowadays, hand phones are getting much powerful, advanced and widely use in any transactions and much of it comes with the functions just like Internet Browser. It can also access into Internet just like PDAs with WI-FI capability. In the future, with more advancement to the gadgets of hand phones, it may replace the total usage of Internet Browser in this system. Using hand phones has several advantages, one of it is that, hand phone is a gadget that is carried and used by most people, so the users can just use a hand phone without the need to sit in front of PC to use the system. Meaning that, this system can be used just by navigation thru hand phones and provides more portability since hand phones can be brought anywhere within its coverage. By implementing this, it is easier for student, lecturers or admin to use the system at anywhere they like. However, using hand phones or PDAs to navigate this system might be not so suitable if this system becomes to big and getting more complex one day since more navigation levels need to be undergo and if it too much, will result loss of user interest on the system itself.

Email Function

Another possible recommendation is to include or add email function towards the system developed by the author. This email function will act as the remainder or notification to inform user, for example to students about their registration status and results. This email function could be used to send email to students once they have completed their registration, add/drop or confirmation process as prove of their transaction done during the sessions. This will be much helpful as the reference to admin and students if any problem occurs. Email function also could be used as the reminder for students to perform course registration if they still have not perform it when due date is very close. By this, it will alert students their tasks and will be much better for system wise. However, this enhancement needs to have email server to handle the process. Since this system uses ASP.NET, it only suits with Microsoft Mail Server and it is quite costly to be purchased by the author.

Short Message Service (SMS) Service

Much simpler idea like above recommendation is to have SMS feature to inform students their registration or add/drop process status once they have done it. This is much easier compared to email function whereby the portability concept makes the user could just receive a SMS anywhere as prove or notification instead of checking email. This technology is quite famous but however, cost is the factor since the cost to purchase SMS gateway is very expensive and normally only provided by outside organizations to assist their system development or providing customer services. Since this project is not related to any outside organization, it is very hard to provide the function but possible to be implemented.

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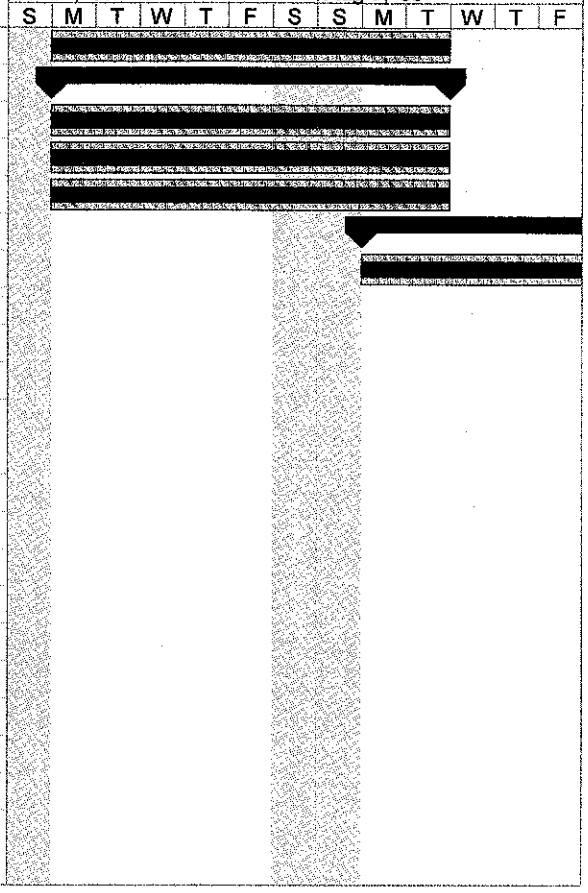
APPENDIX

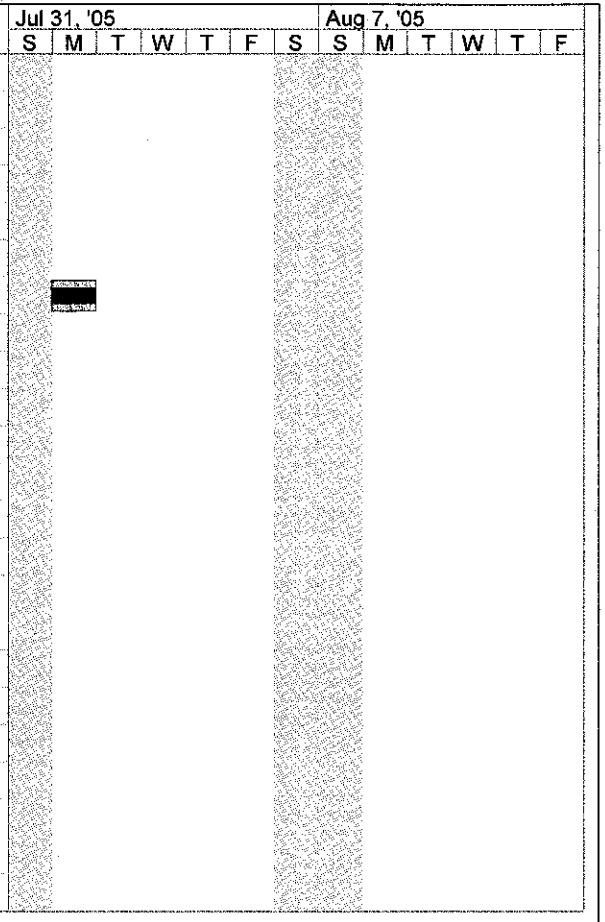
ID		Task Name	Duration	Start	Finish
1	✓	**1. PLANNING / REQUIREMENT DEFINITIONS**	7 days	Mon 8/1/05	Tue 8/9/05
2	✓	**Preliminary Investigation (Chapter 1)**	**7 days**	**Mon 8/1/05**	**Tue 8/9/05**
3	✓	Background Study	7 days	Mon 8/1/05	Tue 8/9/05
4	✓	Problem Statements	7 days	Mon 8/1/05	Tue 8/9/05
5	✓	Objectives & Scopes of Study	7 days	Mon 8/1/05	Tue 8/9/05
6	✓	**Literature Review or Theory (Chapter 2)**	**17 days**	**Mon 8/8/05**	**Tue 8/30/05**
7	✓	Journals and Books Collection	14 days	Mon 8/8/05	Thu 8/25/05
8	✓	Reviewing & Analysis Writing	7 days	Mon 8/22/05	Tue 8/30/05
9	✓	**System & User Requirements**	**7 days**	**Mon 8/29/05**	**Tue 9/6/05**
10	✓	Functional Requirements	7 days	Mon 8/29/05	Tue 9/6/05
11	✓	Non-Functional Requirements	7 days	Mon 8/29/05	Tue 9/6/05
12	✓	**2. SOFTWARE DESIGN / METHODOLOGY**	21 days	Mon 9/5/05	Mon 10/3/05
13	✓	**Hardware & Software Requirements**	**7 days**	**Mon 10/3/05**	**Tue 10/11/05**
14	✓	Hardware Acquirements (if any)	7 days	Mon 10/3/05	Tue 10/11/05
15	✓	Software Installation (if needed)	7 days	Mon 10/3/05	Tue 10/11/05
16	✓	**System Model Design**	**7 days**	**Mon 10/10/05**	**Tue 10/18/05**
17	✓	Design UML Diagram	7 days	Mon 10/10/05	Tue 10/18/05
18	✓	Design DFD Diagram	7 days	Mon 10/10/05	Tue 10/18/05
19	✓	**Interface Design**	**7 days**	**Mon 10/17/05**	**Tue 10/25/05**
20	✓	Students	7 days	Mon 10/17/05	Tue 10/25/05
21	✓	Lecturers	7 days	Mon 10/17/05	Tue 10/25/05
22	✓	Admins	7 days	Mon 10/17/05	Tue 10/25/05
23	✓	**Database Design**	**7 days**	**Mon 10/24/05**	**Tue 11/1/05**



Project: FYP Project
Date: Wed 6/21/06

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

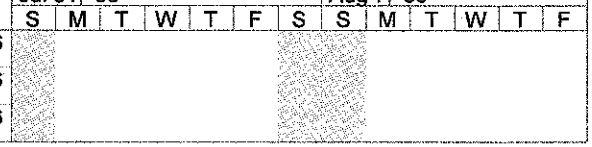
ID	Task Name	Duration	Start	Finish
24	Identify tables and records	7 days	Mon 10/24/05	Tue 11/1/05
25	Identify Attributes & Relationship	7 days	Mon 10/24/05	Tue 11/1/05
26	**REPORT & DOCUMENTATION WRITING**	0 days	Fri 11/4/05	Fri 11/4/05
27	**Submisson of Interim Report**	**1 day**	**Fri 11/4/05**	**Fri 11/4/05**
28	Introduction & Overview	1 day	Fri 11/4/05	Fri 11/4/05
29	Literature Review	1 day	Fri 11/4/05	Fri 11/4/05
30	Prototype Presentation	1 day	Mon 8/1/05	Mon 8/1/05
31	**3. PROGRAMMING & RE-ENGINEERING**	79 days	Tue 1/24/06	Fri 5/12/06
32	**Tasks**	**20 days**	**Mon 1/23/06**	**Fri 2/17/06**
33	Student Entity Module	15 days	Mon 1/23/06	Fri 2/10/06
34	Lecturer Entity Module	10 days	Mon 2/6/06	Fri 2/17/06
35	Admin Entity Module	5 days	Mon 2/13/06	Fri 2/17/06
36	**Report & Documentation Writing**	5 days	Mon 2/13/06	Fri 2/17/06
37	**Submisssion of Progress Report**	**0 days**	**Fri 2/17/06**	**Fri 2/17/06**
38	Methodology (Chapter 3)	0 days	Fri 2/17/06	Fri 2/17/06
39	**4. TESTING & DEBUGGING**	**45 days**	**Mon 1/23/06**	**Fri 3/24/06**
40	WebServer Testing	25 days	Mon 1/23/06	Fri 2/24/06
41	Alpha Testing	7 days	Mon 2/27/06	Tue 3/7/06
42	Beta Testing	10 days	Mon 3/13/06	Fri 3/24/06
43	**5. OPERATION & MAIINTENANCE**	35 days	Mon 3/27/06	Fri 5/12/06
44	**REPORT & DOCUMENTATION WRITING**	10 days	Mon 5/8/06	Fri 5/19/06
45	**Submission of Dissertation Final Draft**	**0 days**	**Fri 5/26/06**	**Fri 5/26/06**
46	Results Discussion (Chapter 4)	0 days	Fri 5/26/06	Fri 5/26/06



Project: FYP Project
Date: Wed 6/21/06

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

ID	Task Name	Duration	Start	Finish
47	Conclusions & Recommendations (Chapter 5)	0 days	Fri 5/26/06	Fri 5/26/06
48	**Oral Presentation**	2 days	Fri 6/16/06	Mon 6/19/06
49	**Submission of Project Dissertations**	1 day	Fri 6/23/06	Fri 6/23/06



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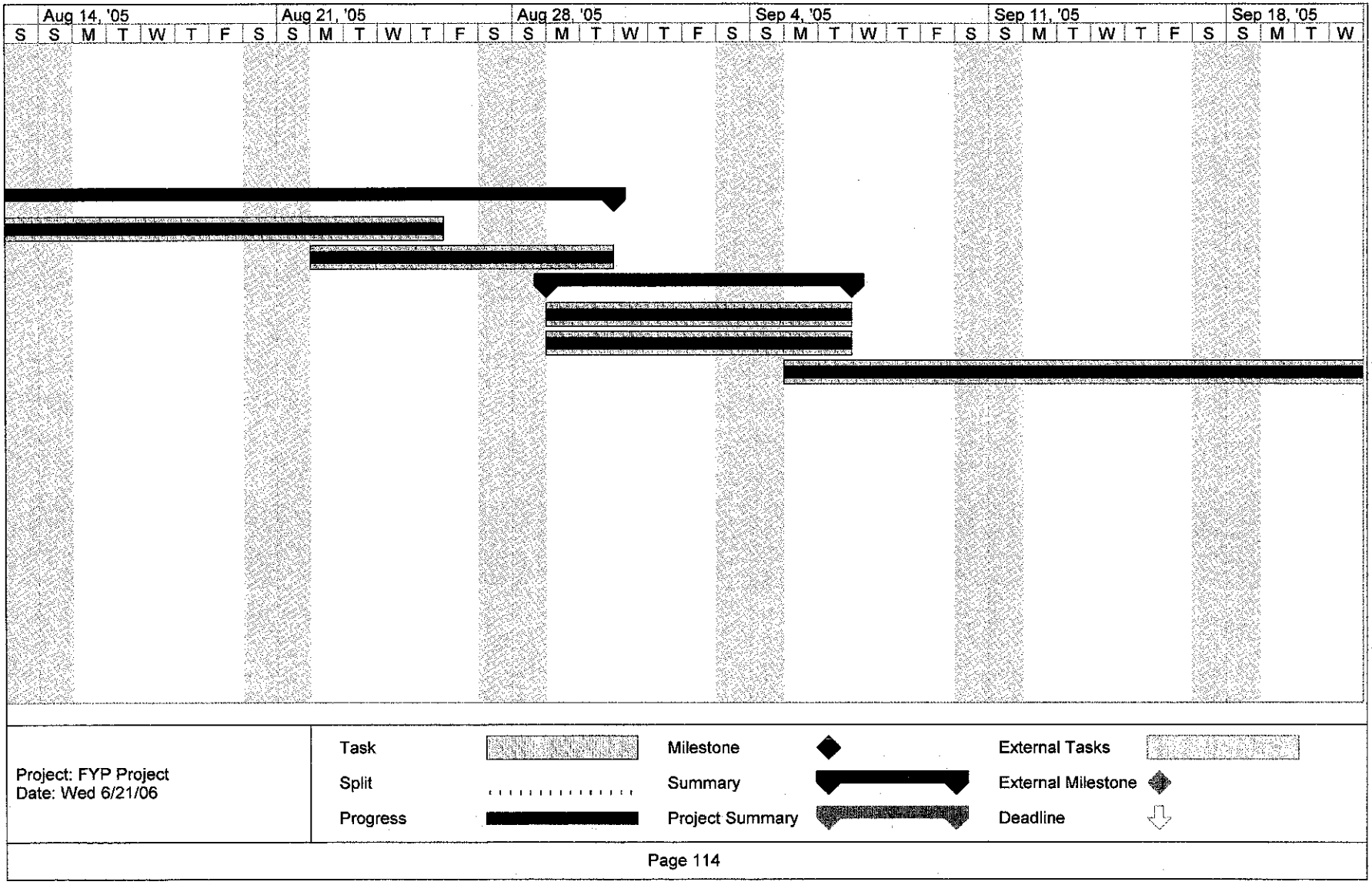
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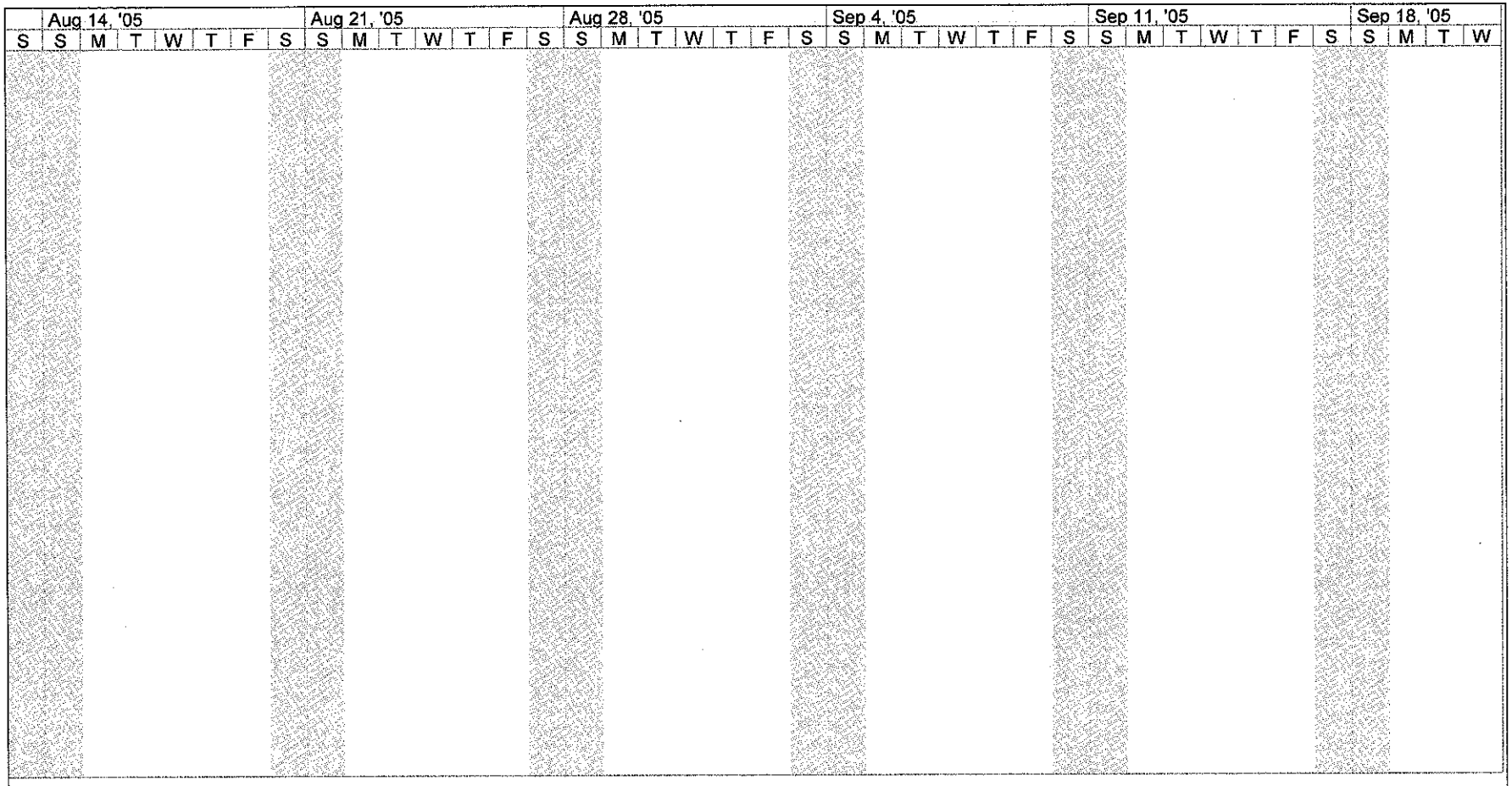
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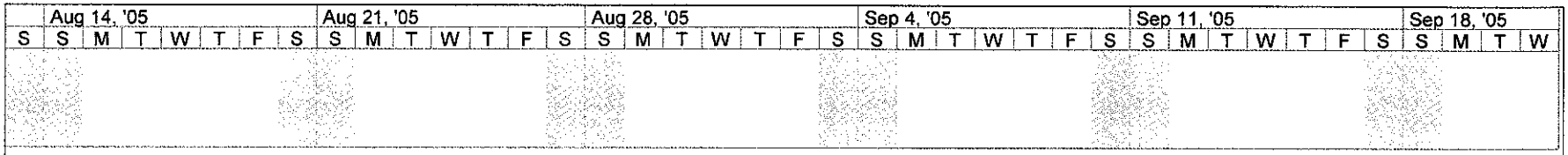

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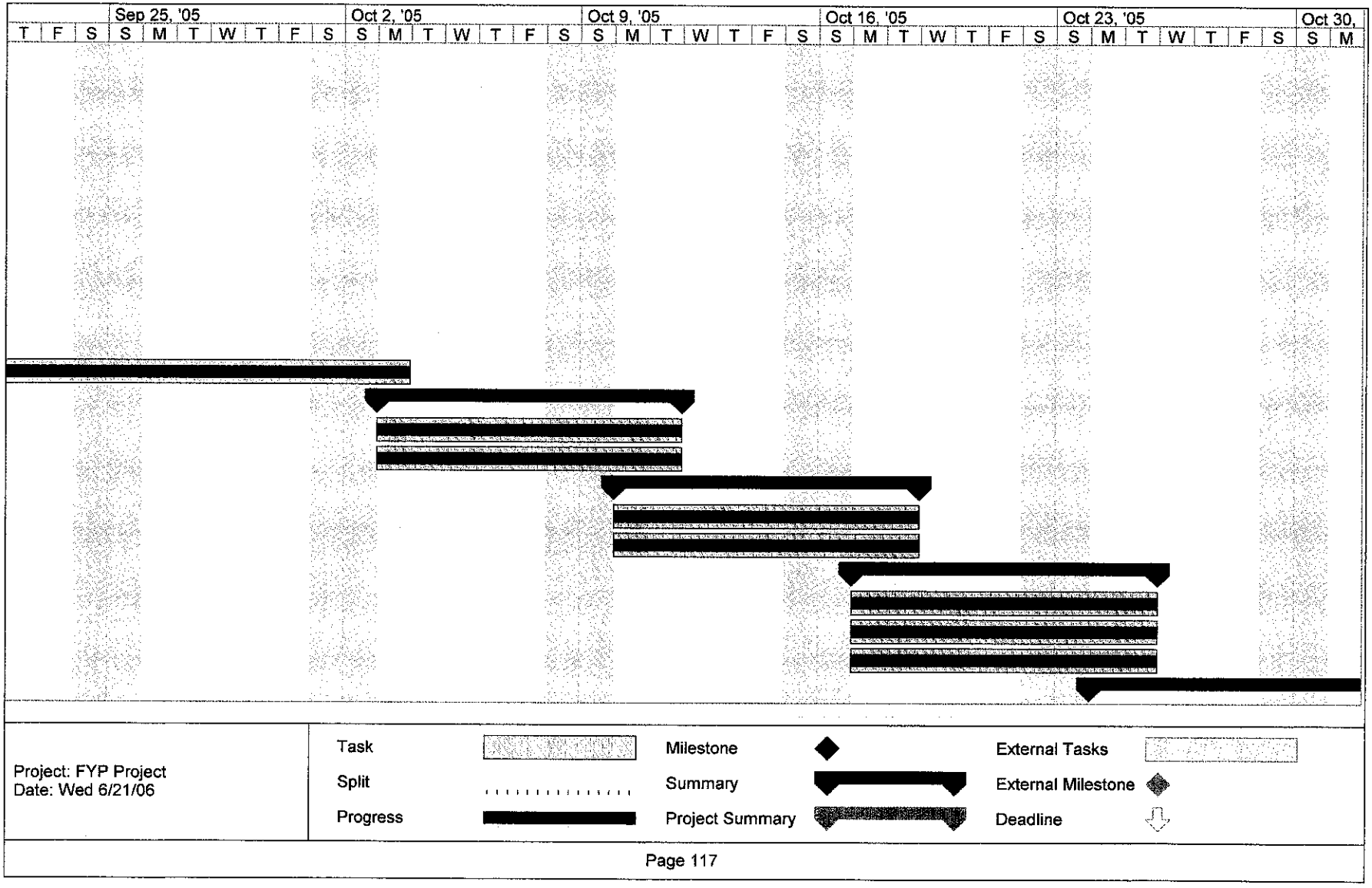
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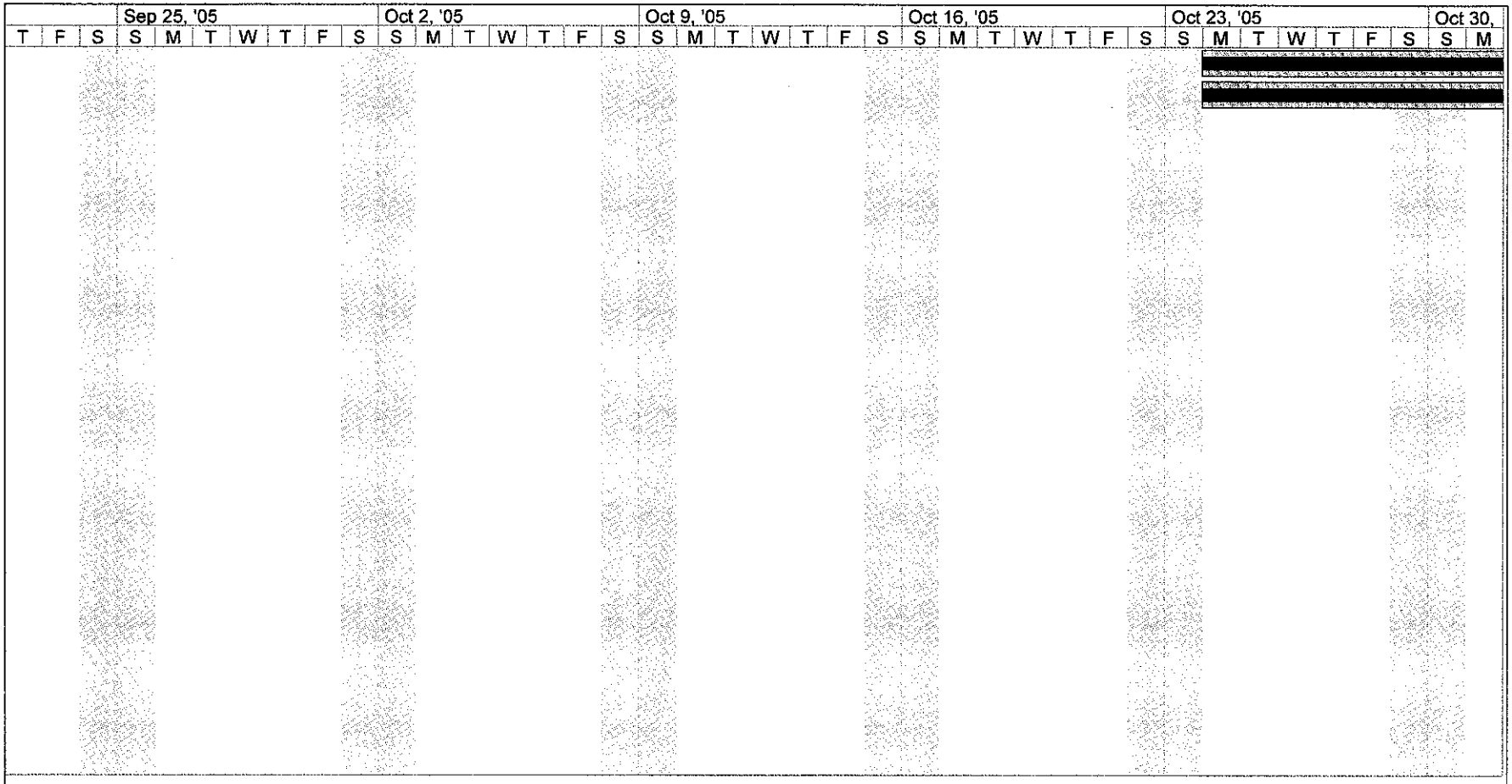
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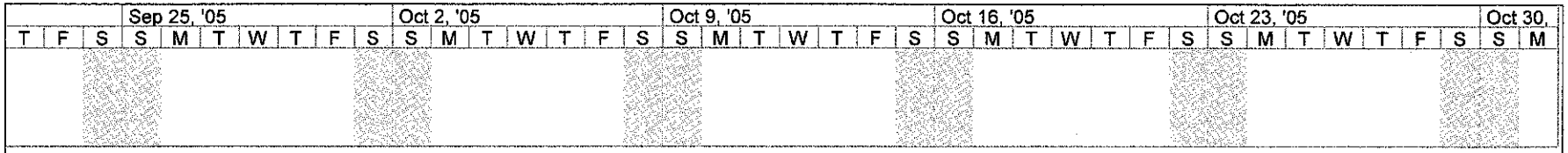
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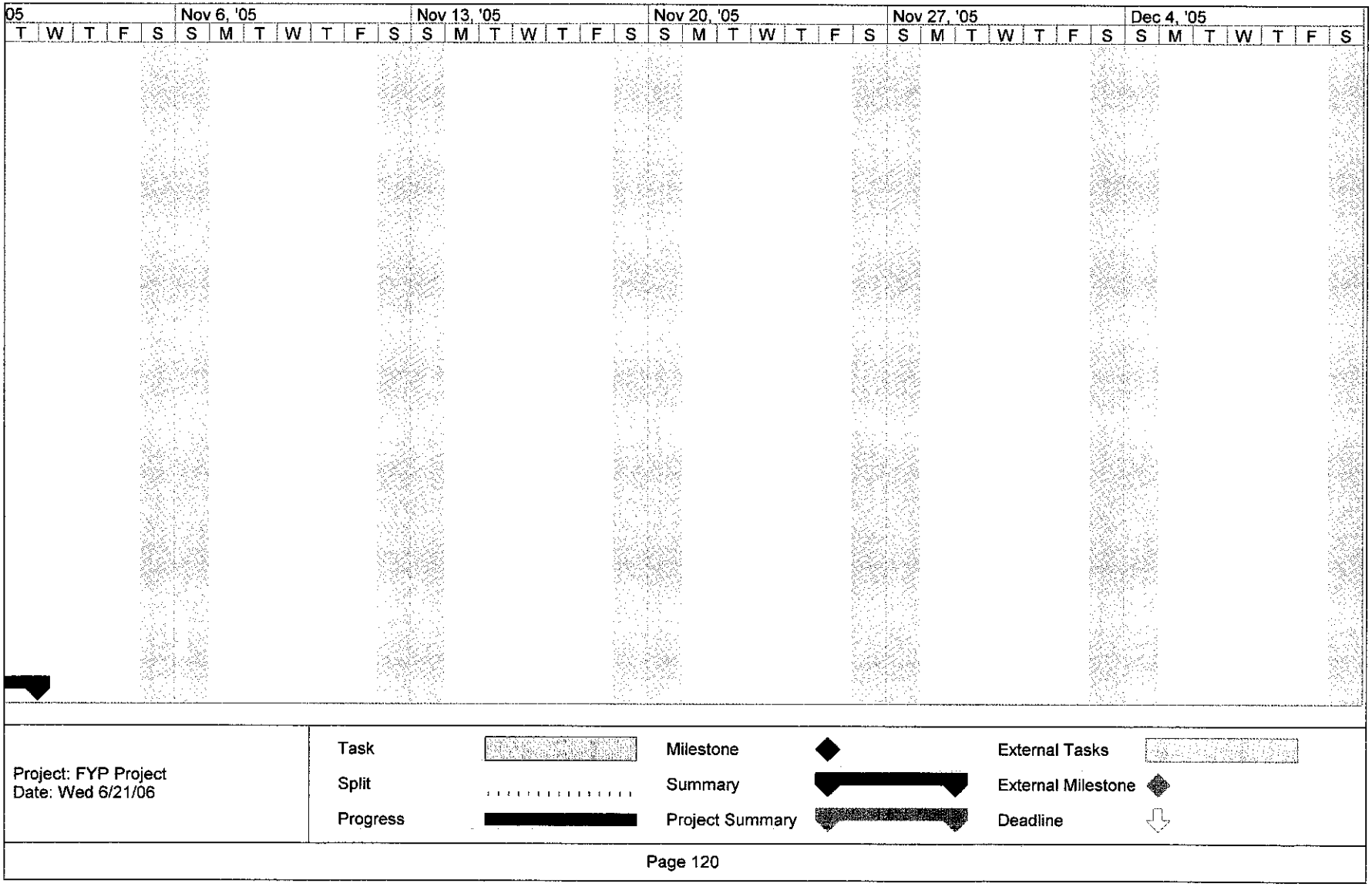
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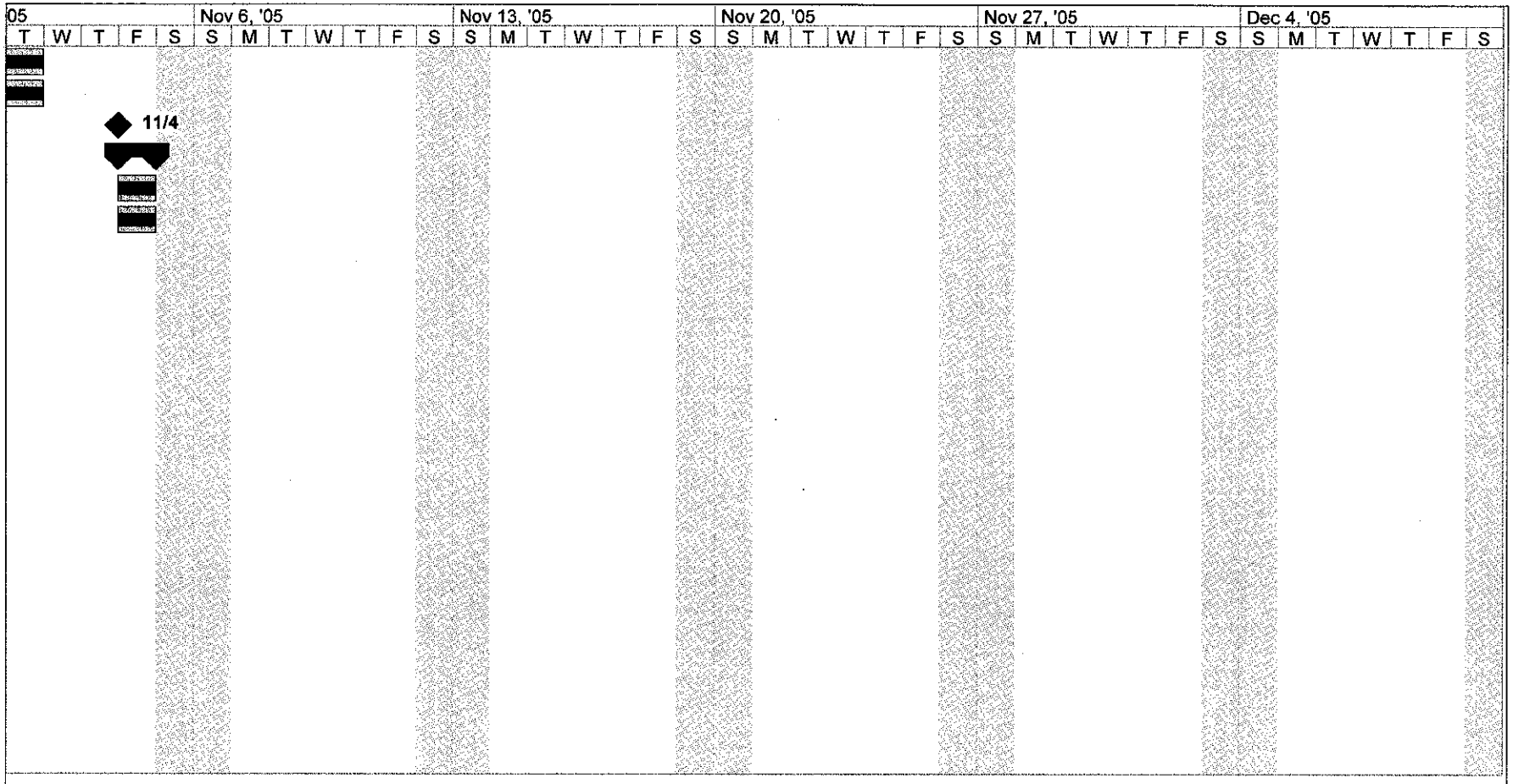

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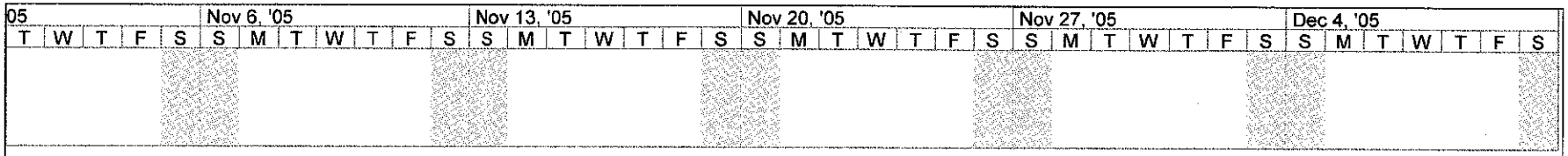

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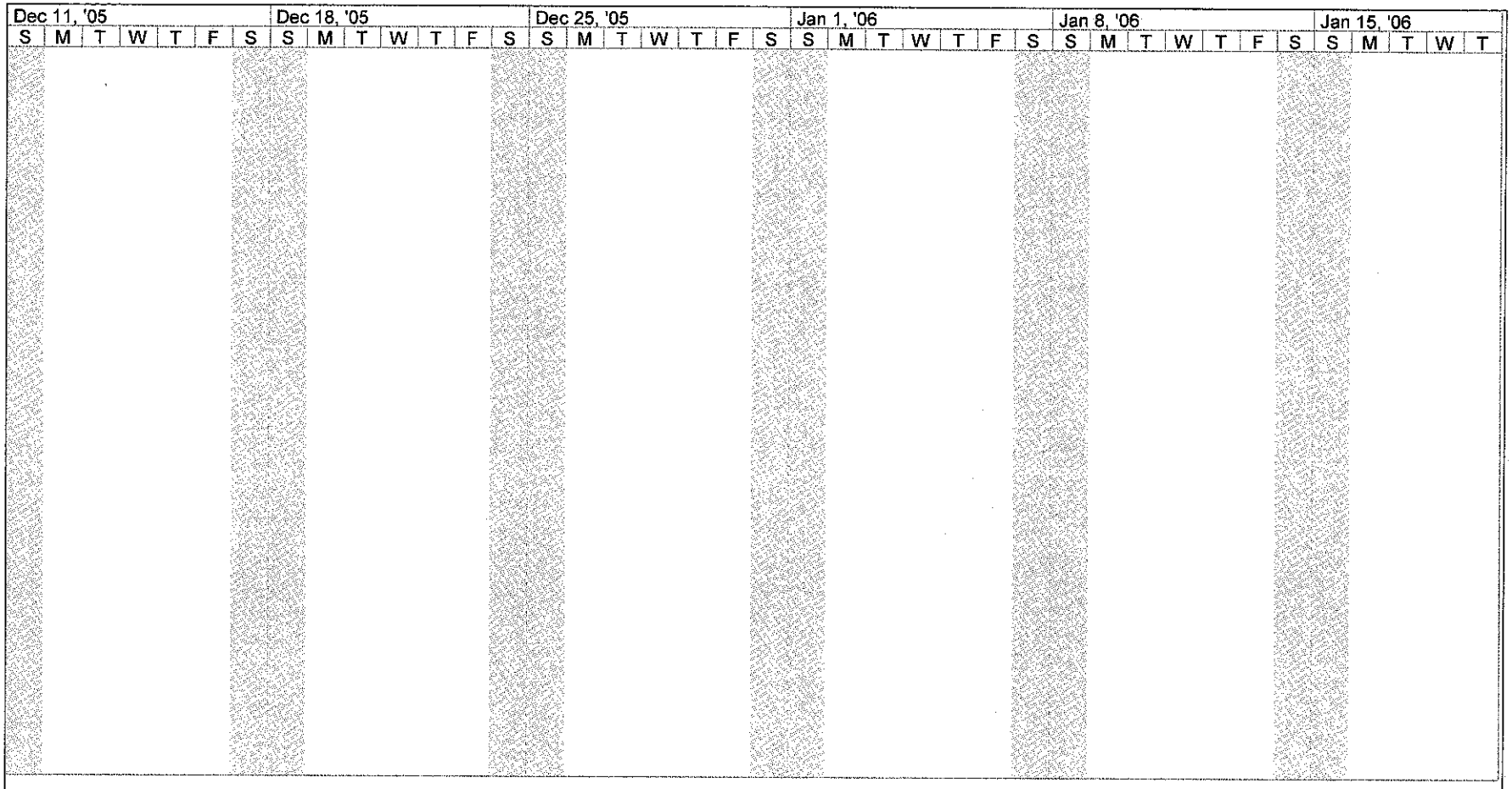
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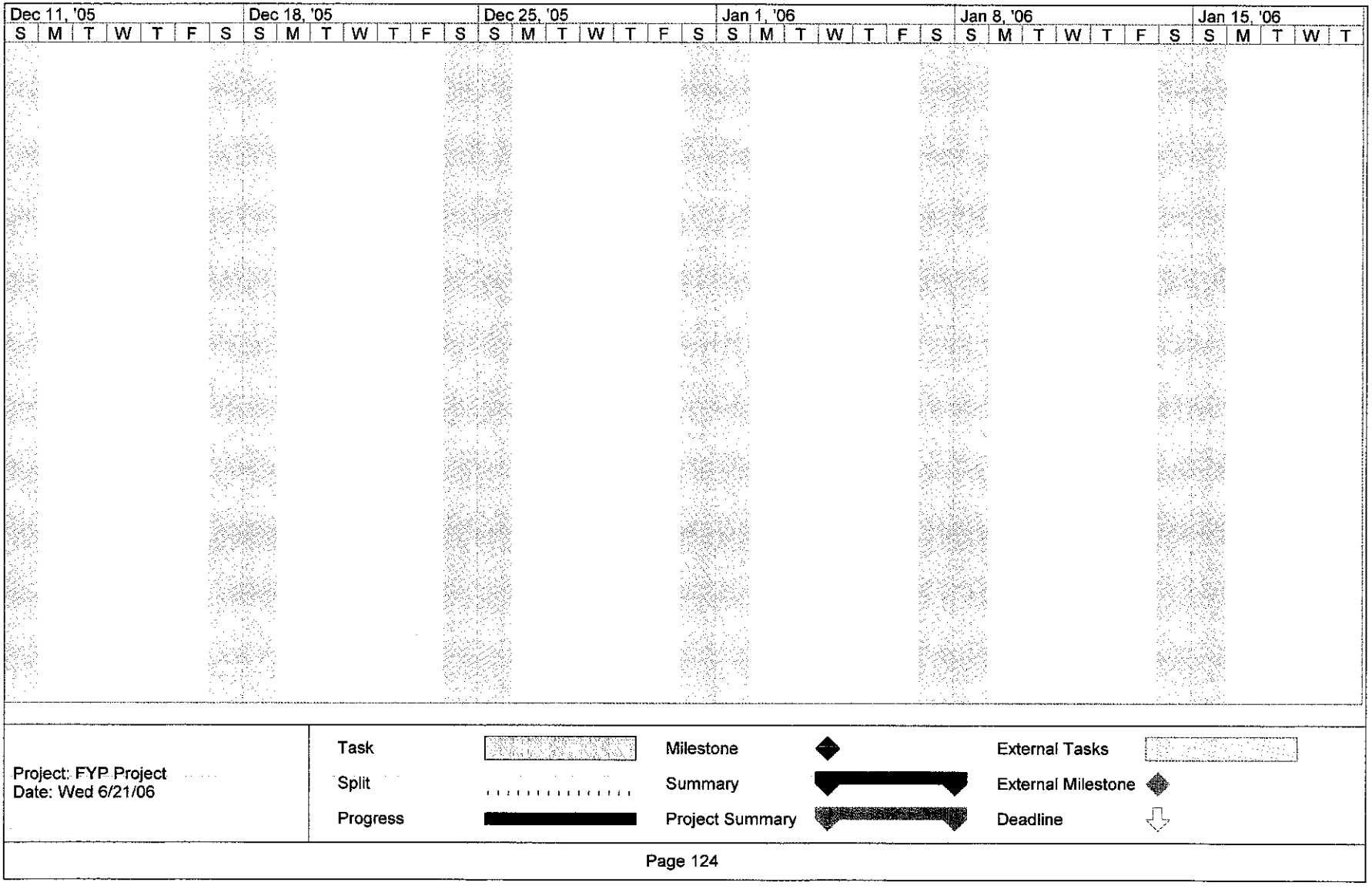
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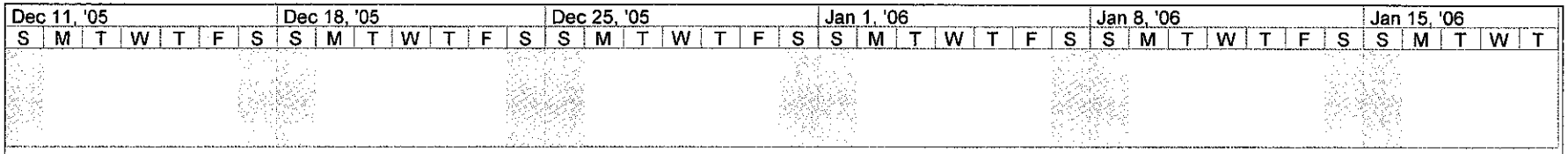

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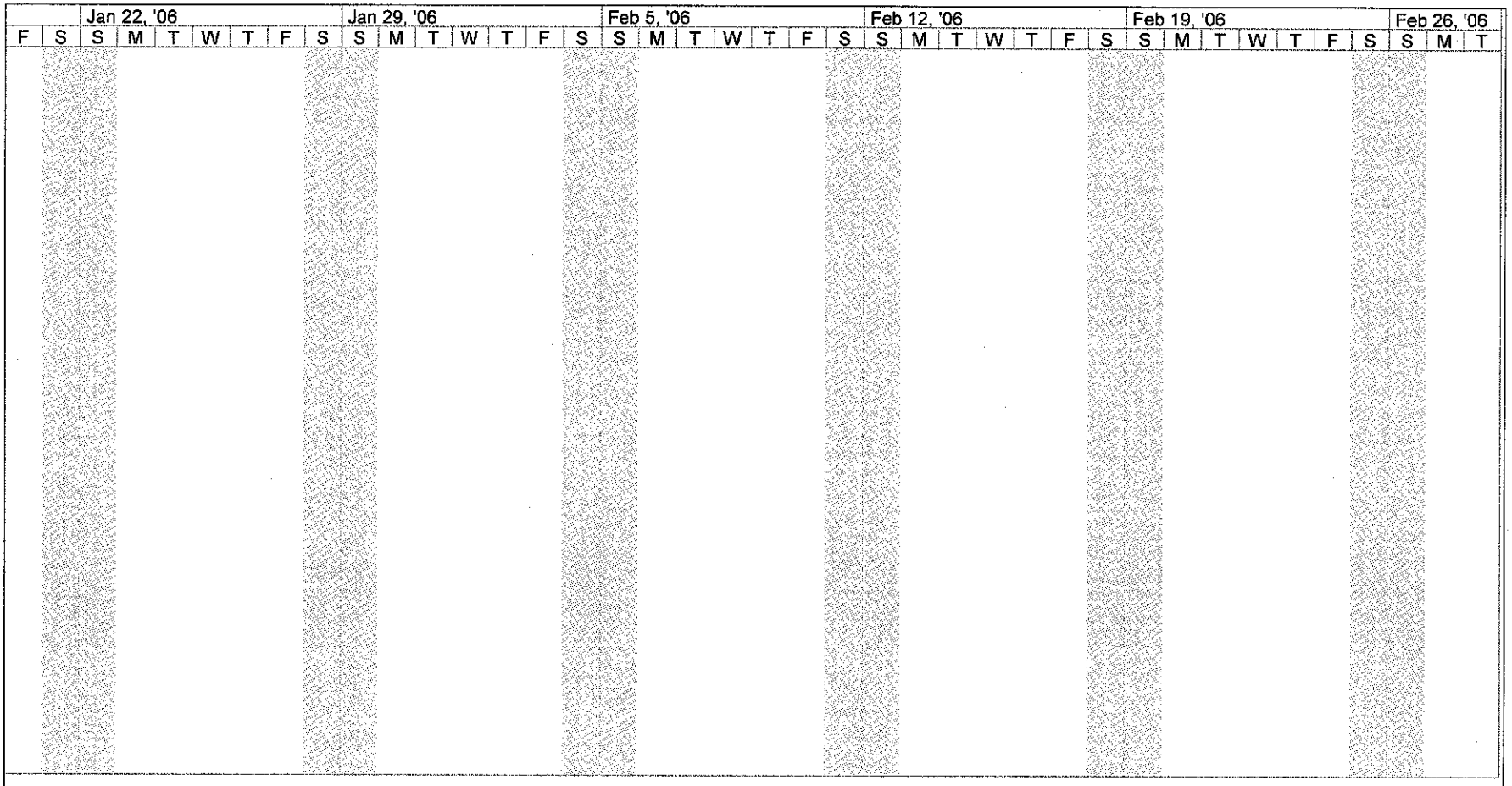

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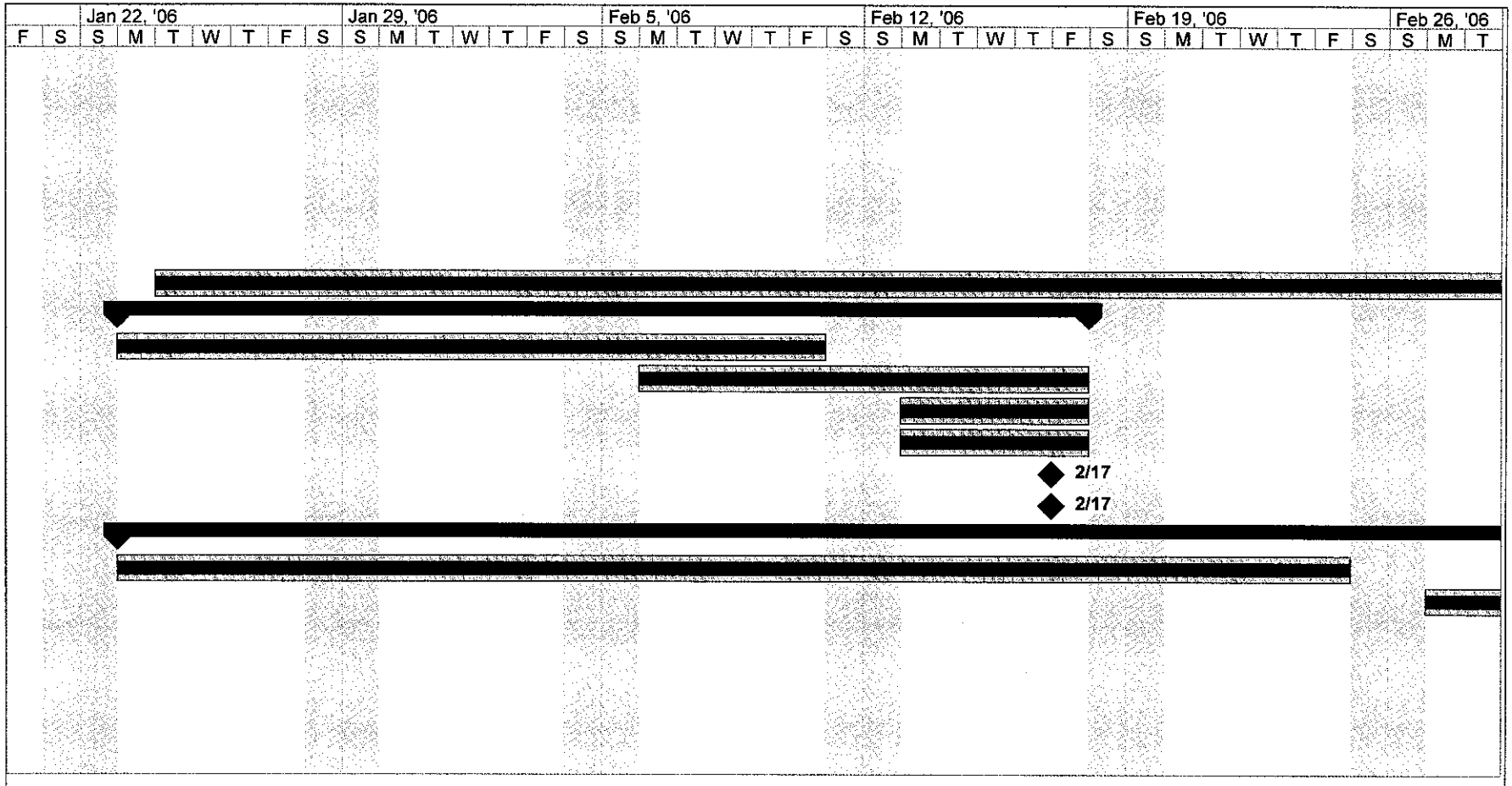

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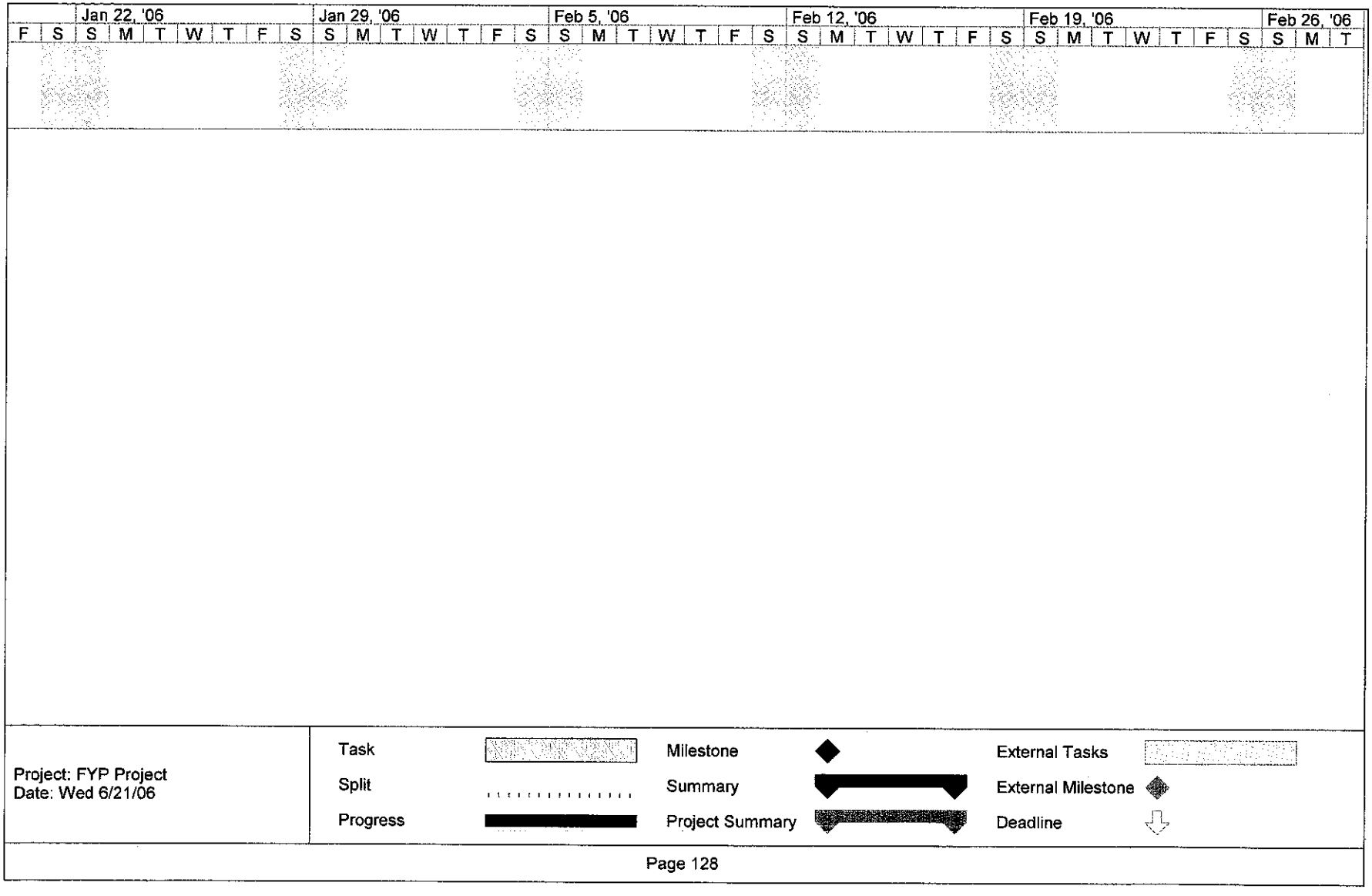
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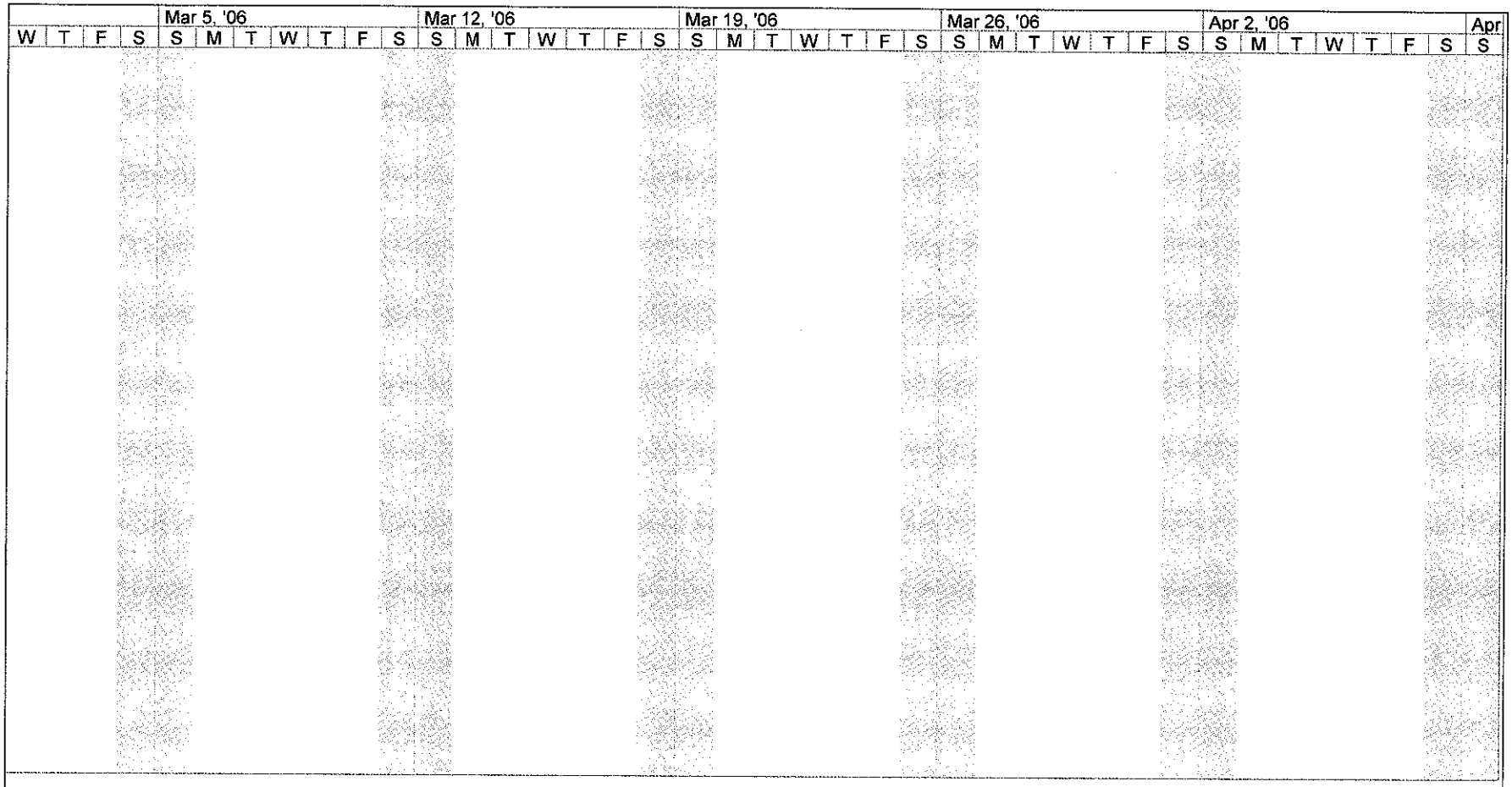
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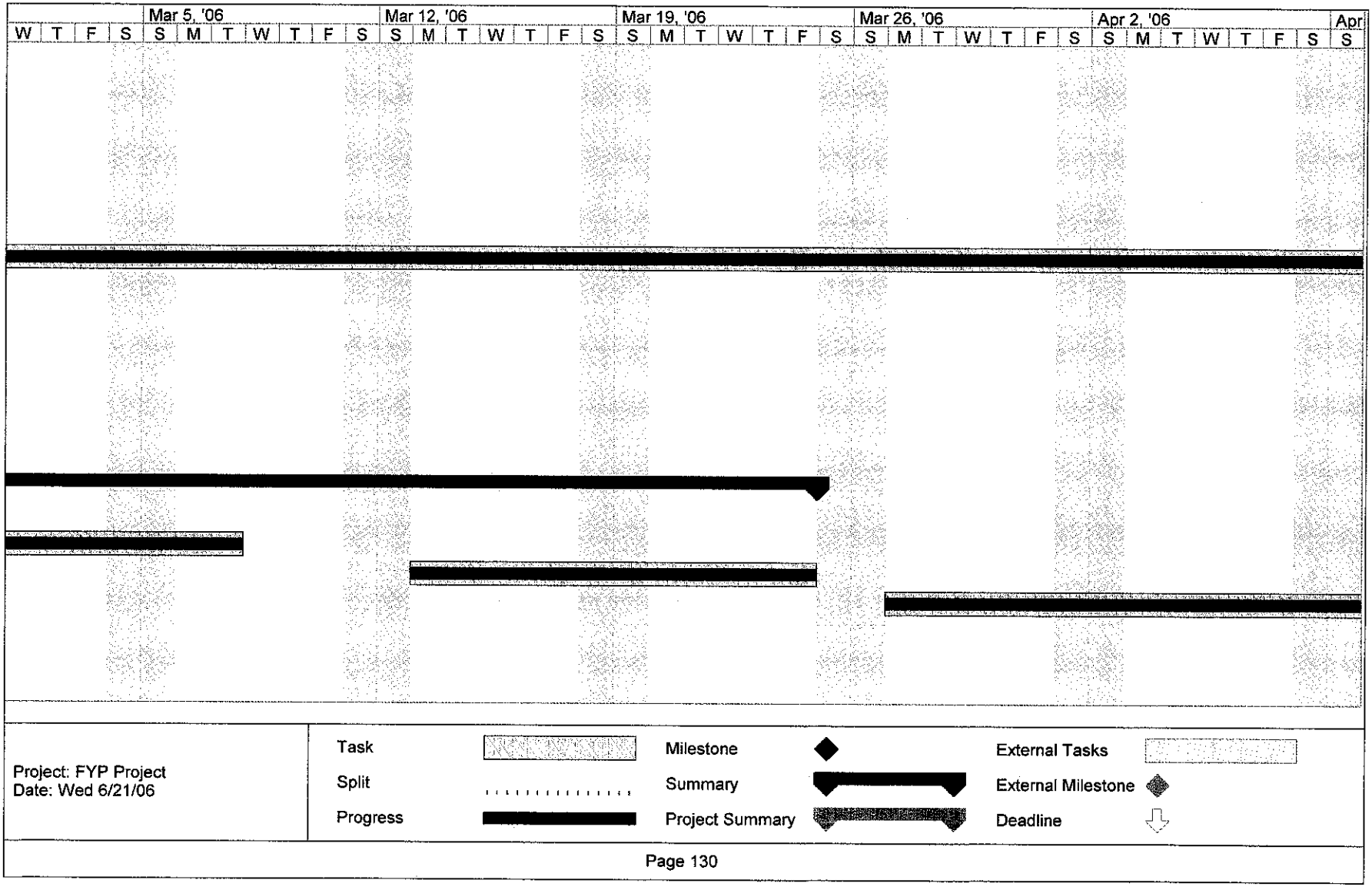
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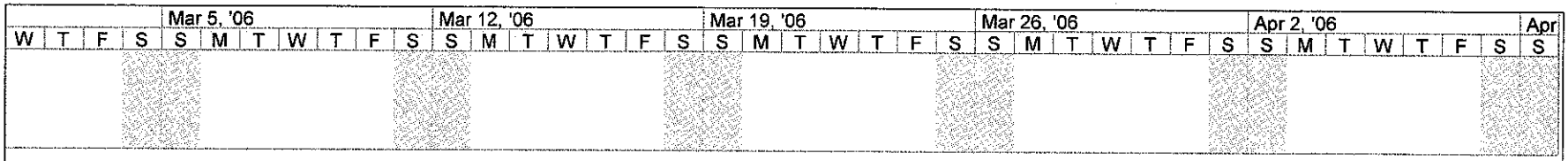

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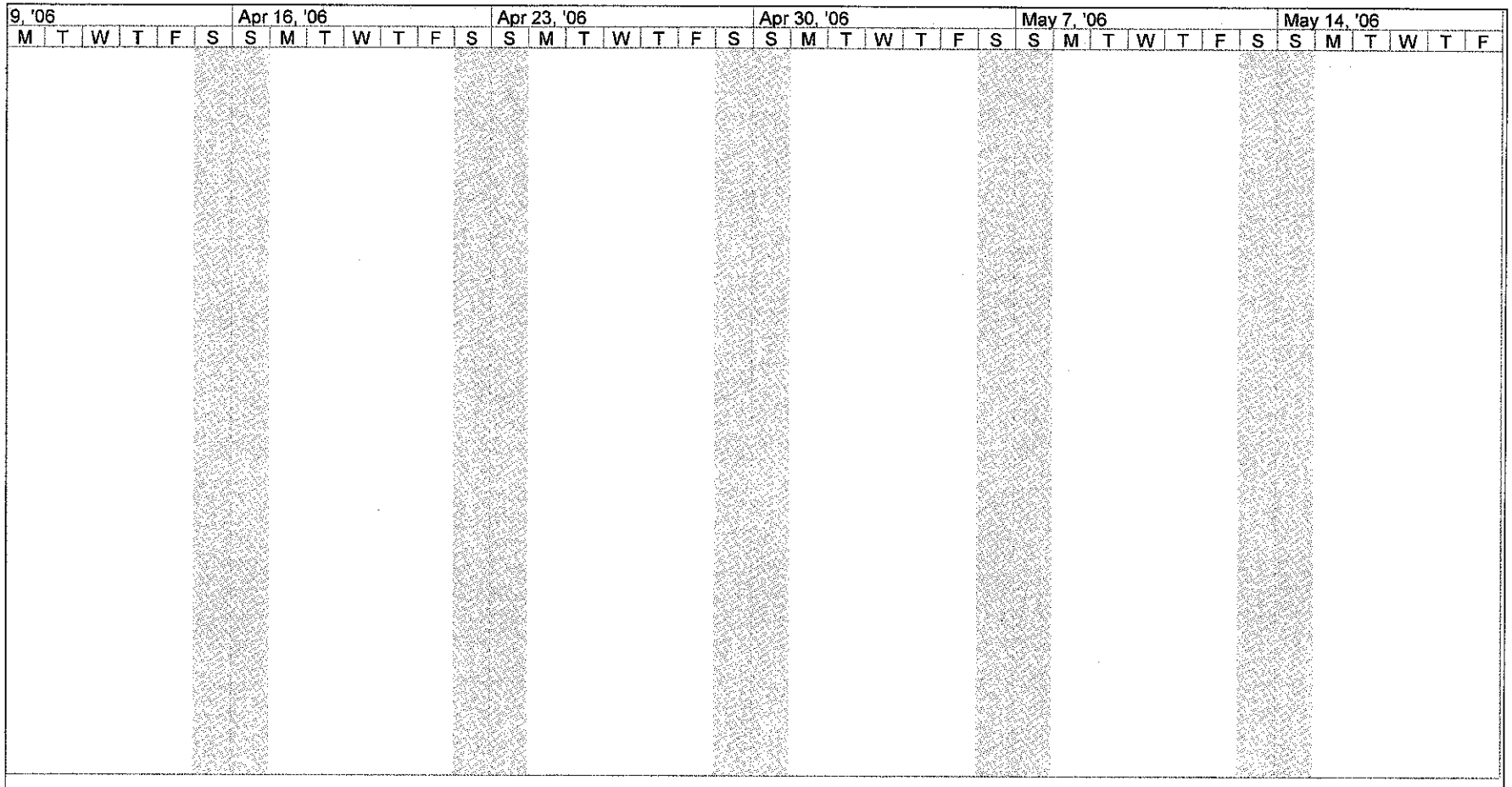

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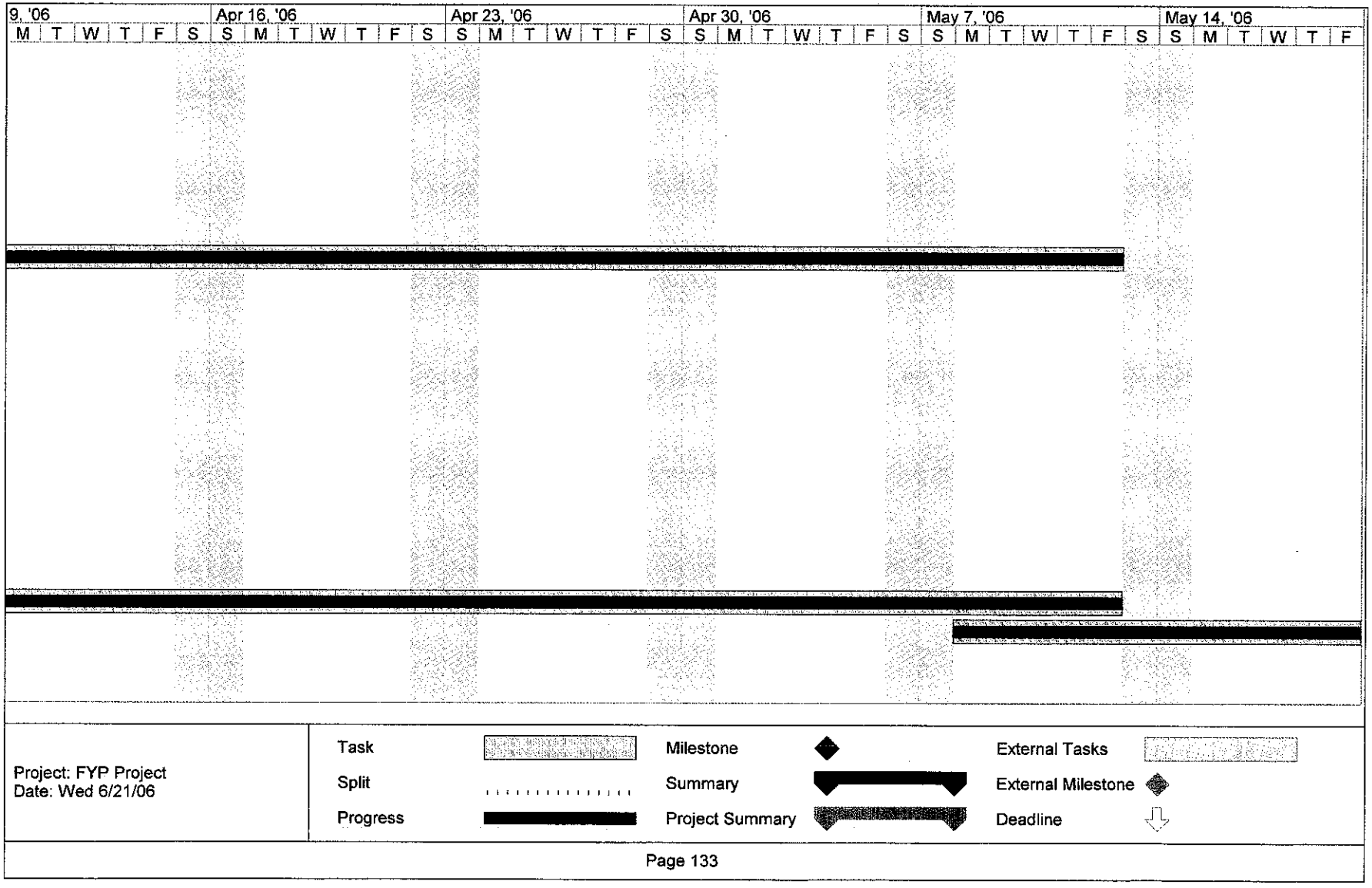
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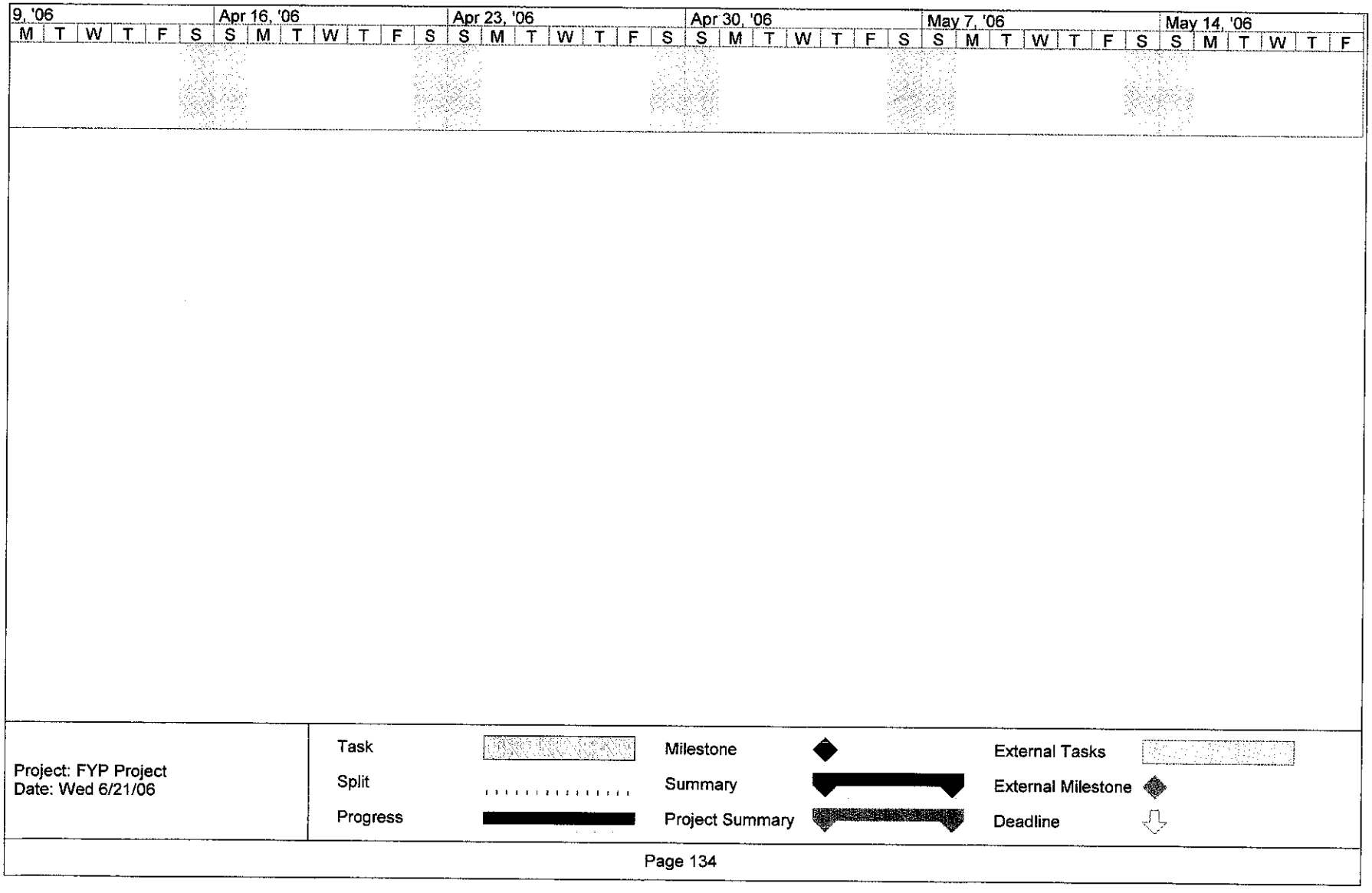
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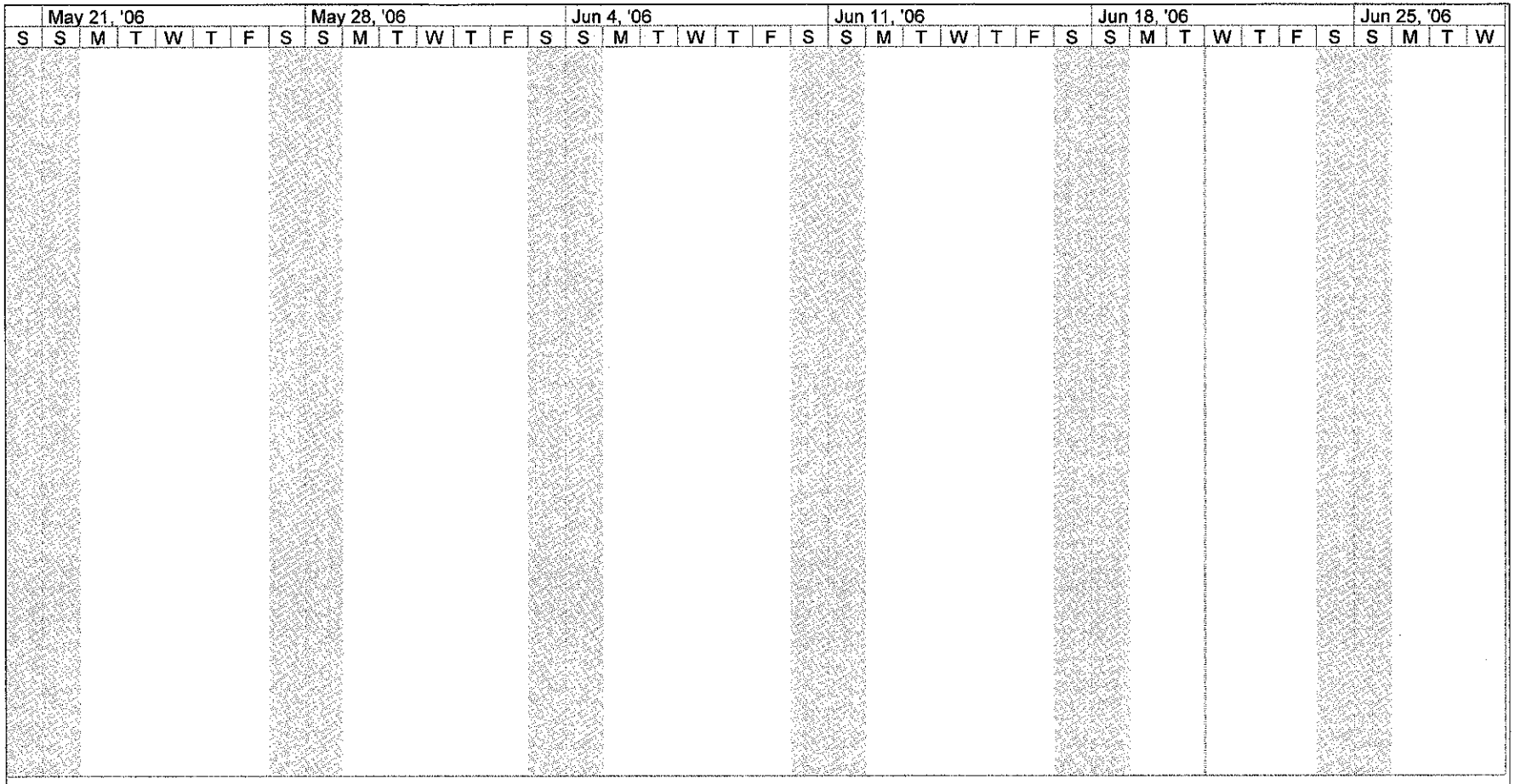
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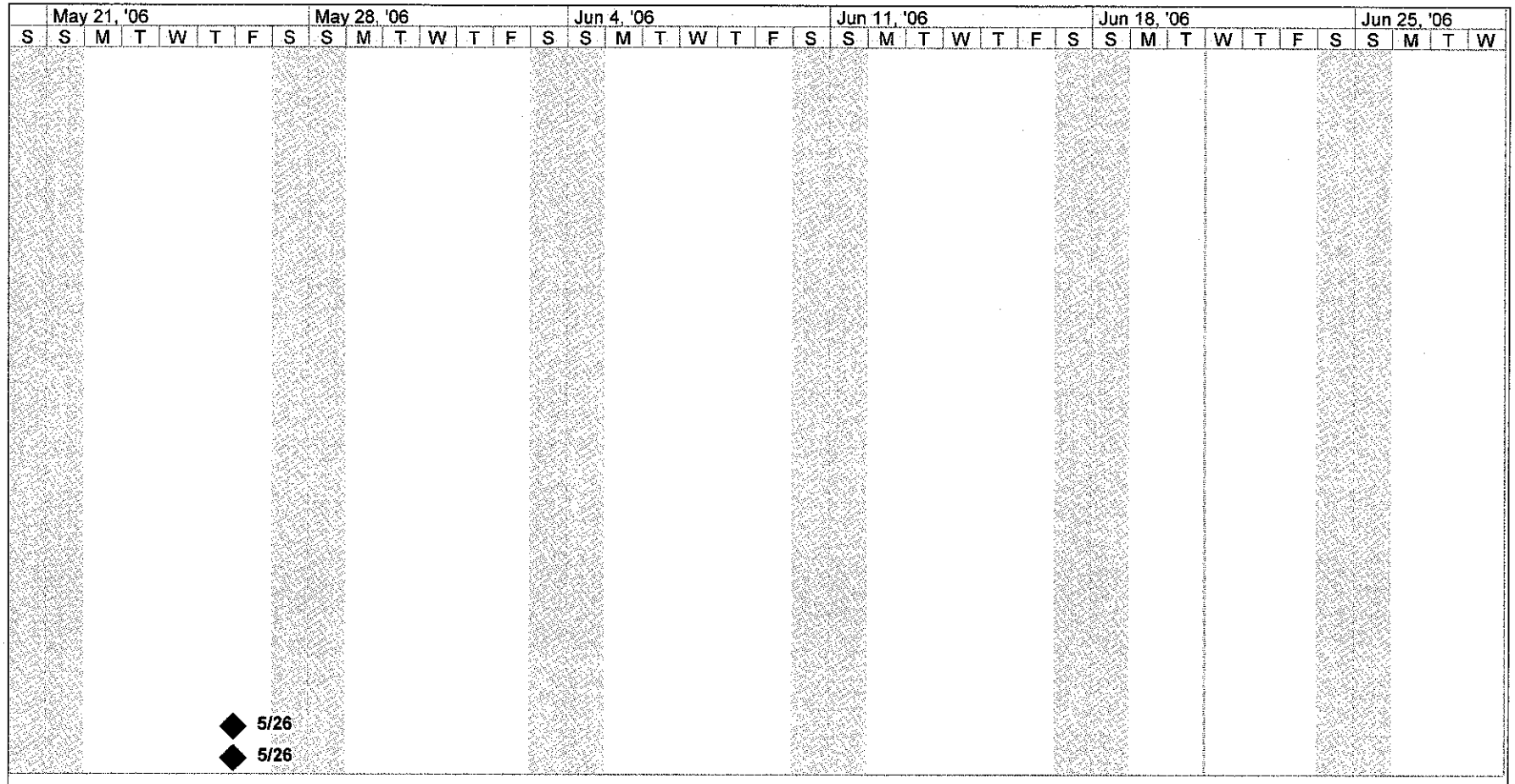

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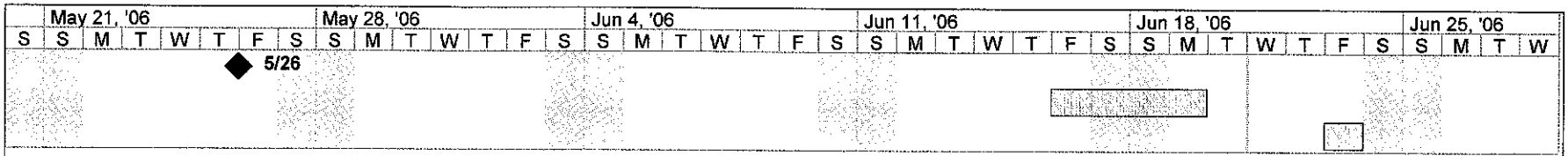

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